August 2015

Specifications for Science Building Addition and Alterations

John E. Brink
Kansas State Architect Office

T. Marion Heter
Kansas State Architect Office

Set # 7 Albertson Hall (?)
Dr. Tomanek

SPECIFICATIONS FOR

SCIENCE BUILDING ADDITION AND ALTERATIONS

FORT HAYS KANSAS STATE COLLEGE

HAYS

20 OCTOBER 1960

OFFICE OF STATE ARCHITECT

JOHN E BRINK · STATE ARCHITECT

T MARION HETER · ASSOCIATE ARCHITECT

STERLING, KANSAS

A D D E N D U M N O. 5

OFFICE OF STATE ARCHITECT

TOPEKA, KANSAS

November 28, 1960

NOTICE TO ALL CONTRACTORS BIDDING ON LABORATORY EQUIPMENT, ADDITION AND ALTERATIONS TO SCIENCE BUILDING, FORT HAYS KANSAS STATE COLLEGE, HAYS, KANSAS.

Gentlemen:

Please take note of the following changes in the specifications and drawings for the subject project:

Item No. 1 (Cancellation of Bids):

(a) All bids on Laboratory Equipment, due to be received on December 8, 1960, is hereby cancelled until additional funds are secured.

(b) Bidders may retain drawings. Revised specifications will be issued at a later date when adequate monies are available.

RECEIPT OF THIS ADDENDUM MUST BE ACKNOWLEDGED ON THE PROPOSAL FORM.

John E. Brink
State Architect

A D D E N D U M N O. 4

OFFICE OF STATE ARCHITECT

TOPEKA, KANSAS

November 18, 1960

NOTICE TO ALL CONTRACTORS BIDDING ON LABORATORY EQUIPMENT, ADDITION AND ALTERATIONS TO SCIENCE BUILDING, FORT HAYS KANSAS STATE COLLEGE, HAYS, KANSAS.

Gentlemen:

Please take note of the following changes in the specifications and drawings for the subject project:

Item No. 1 (Change of Bid Date):

(a) In accordance with the notification issued by the Purchasing Division of the Department of Administration on November 16, 1960, the date for receiving of bids of the Laboratory Equipment is hereby extended from November 17, 1960 to December 8, 1960.

Item No. 2 (Revised Bid Proposal):

(a) Attached to this addendum is a revised Bid Proposal with spaces provided for bidding alternate materials. This form must be used in submitting bids.

Item No. 3 (Addendum No. 2):

(a) Addendum No. 2, dated November 8, 1960, Item No. 2. Colorlith tops shall be bid on an alternate bid as hereinafter specified.

Item No. 4 (Equipment Schedule):

(a) On page 20-17, Paragraph 20-28, Equipment Schedule shall be revised as follows:

Room A101

Item #1

4 - Chemistry tables 12' long. Consisting of [illegible] base cabinets each side [illegible] drawers with locks and [illegible]. Lead lined trough in center. Supported by stands and [illegible] #1015 [illegible] Sink with metal [illegible]. Top to be of [illegible] or equal. Fixtures to consist of the following mounted [illegible] top: 5 cold water cocks, gas cock [illegible], 10 gas cocks, 4 double-faced duplex 110 volt AC [illegible] outlets.

Item #2

2 - [illegible], 8' Air Flow fume hoods equipped with remote control [illegible]. 2 cold water, 2 gas, 2 air, 1 - 110 volt outlet, 2

tube fluorescent light fixtures with switch, and 3 way blower switch with warning lights. Cup sink, tail piece, and lead P-trap. Blower #1 1/2 H with blower shelf and suspension system.

Item #3

4 - #3346 balance table - [illegible] glass tops with 3/4" Kemrock and 1/4" Felt. Each with Burette rack superstructure case enclosures glazed on 4 sides and with counter-balanced sliding sash. Fluorescent lights mounted over the glass top with switch wiring and hook up by others.

Item #4

1 - #3401 Instructors Desk with Kemrock top. Services #1003 Duroon sink, 2 cold water [illegible], 1 double gas cock, one duplex 110 volt AC electric, 2 support rods with crossbar.

Item #5

2 - #136 glazed swinging door storage cases.

Room A104

Item #6

1 - #30 and one (1) #1[illegible] base cabinet with Kemrock top and 4" back splash, 29" x [illegible] with pedestal mounted 2 way gas and duplex 110.

Item #7

1 - #[illegible] 4' Air [illegible] hood with remote control air, gas, and cold water. Lead cup sink. #1 1/4 H Blower with blower shelf and suspension system. Fluorescent light fixture with switch and 3 way blower switch with warning lights. 1 Duplex electrical 110 AC.

Item #8

1 - #225 wash-up sink assembly with #13 base unit one side #1[illegible] base other side. Provide filler panel as required. Top Kemrock with 4" back splash and [illegible] ledge. Services to be supported by [illegible] and consisting of 2 double gas cocks, 2 duplex receptacles, hot and cold water mixing faucet, Duroon sink.

Item #9

1 - #126 open wall shelving cabinets.

Room A105

Item #10

1 - #[illegible] Darkroom developing table Kemrock with services as cataloged. 1 only #7140 base cabinet, 1 only #7[illegible] with Kemrock top and ledge to match developing table. 1 additional 110 AC duplex with switch.

Room A106

Item #11

1 - #SW142 Wall Table. 1 only 7079, 1 only 7050. Top to be of Kenrock, 4" back splash with 5" ledge. Durcon sink. Hot and cold water, 1 double gas cock, 1 duplex 110 volt AC pedestal electric.

Room A107

Item #12

1 - #SW142 Wall Table. 1 only 7079, 1 only 7050. Top to be of Kenrock, 4" back splash with 5" ledge. Durcon sink. Hot and cold water, 1 double gas cock, 1 duplex 110 volt AC pedestal electric.

Room A108

Item #13

2 - #2S1116T 6' Airflex Gas hoods each with remote control gas, water and air, two 110 Volt AC and two 220 Volt AC outlets. 2 tube fluorescent light fixtures with switch. Blower switch with warning light. Cup sink. Mirror shelf and Mirror #1 1/2 H and suspension system.

Item #14

2 - Center tables each consisting of 8 #30 Base cabinets all drawers with runners and locks, two #21 sink cabinets. Top Kenrock 54" x 34", 2 cold water #347 faucets, 6 #272 gas, 6 #272 air, 4 double faced pedestal duplex electrics. Each with two 110 V and two 220 Volt outlets. #1066 Durcon Sink.

Item #15

1 - Wall Table assembly consisting of 2 #7067 Sink Bases, 4 #7124 Base Cabinets, 2 #7066 Durcon Sinks, 2 #260 Water Fixtures, 4 #286-2 air, 4 duplex receptacles, 1/2 120 and 1/2 120 V., top Kenrock 201-08 Beige, 2½" deep with 6" back splash and ledge centers supported by plates and mounted on back splash.

Item #16

1 - Wall table assembly consisting of 2 #7124 base cabinets, 2 #7142 and 1 #7067 sink base top Kenrock 25" wide 4" back splash and 5" ledge, 1 #7066 Durcon sink. 1 #260 [illegible] Cabinets, 2 #286-2 Gas, 2 #286-2 Air, 2 Duplex Receptacles, 1/2 110 V. and 1/2 220 V. mounted in back splash. All drawers with locks and runners.

Item #17

3 - #7507 Panel swinging door cases.

Room A116

Item #18

1 - Island table consisting of 8 #7166 Base cabinets, 2 #7087 sink cabinets, top to be of stainless steel, 12' x 48" with service deck moulded in corner and supported by Struts. 2 #1006 sinks. All drawers and cupboards with locks and numbers, 2 #350 water fixtures, 4 #272 gas, 4 #272 air, 4 double faced pedestal duplex electrics, 1/2 110 V. and 1/2 220 V.

Item #19

1 - Wall table assembly consisting of 4 #7166 base units. Kenrock top, 6" B.S. with 5" ledge. Services mounted in B.S. 2 #286-2 gas, 2 #286-2 air, 4 duplex electrics, 1/2 110 V. AC and 1/2 220 V. AC.

Item #20

1 - #231016 4' Air Flow hood (Isotope) with remote control 2 gas, 2 air, 2 water, 4-110 V. AC and 2-220 V. AC, 2 tube fluorescent light fixture with switch and blower switch with warning light. SS cup sink. Blower #6V mounted on shelf and suspension system. 1 #855 filter housing with 1 Pri. filter and 1 GAB type filter.

Item #21

2 - Wall assemblies each consisting of 2 #7079 Base units with 6' Kenrock top and 4" B.S.

Room A124

Item #22

1 - Wall assembly consisting of 2 #7166 base cabinets, 1 #7087 base cabinet, top Kenrock with 6" BS and 5" shelf. Sink #1006, water #350, head play, strainer, tail piece and P. trap, 2 #286-2 gas, 2 #286-2 air, 2 duplex receptacles, 1/2 110 V. AC and 1/2 220 V. AC.

Room A125

Item #23

1 - #8359 Instrument desk and service unit as ordered.

Room A205

Item #24

1 - Preparation assembly to consist of 1 #7077 base, 1 #7067 base, 1 #7140 base, top Kenrock with 6" back splash and 5" shelf. 1 - #1006 Button sink, 1 - 350 water, 1 #286-2 gas, 1 #286-2 air.

Room A207

Item #25

4 - #8490 desktop centre tables with two lead cup sinks, 2 #337 water fixtures, 4 #308 gas, 4 #308 air, Kenrock top.

Item #26

1 - Wall assembly consisting of 4 #7537.

Item #27

1 - Wall assembly consisting of #8336 wall storage with addition of one more open shelving and base unit in center. Length 15' 7 3/8".

Item #28

1 - Wall table consisting of 3 #7122 base units Kenrock top and 4" B.S.

Room A213

Item #29

1 - #5W10 Instructor's desk and services as cataloged.

Item #30

6 - #8W30 Student Physio tables with top 48" x 6' Greenwald, 1 #7000 Duncan sink, 2 #279-2 combination gas and water 2 double face duplex pedestal receptacles 1/2 110 V. AC., 1/2 220 V. AC and Duralumin support rods, cross bars and clamps. 4 model B.P.C. swing chair corner bracket attached with pogo stick. Locks and number on all drawers.

Item #31

2 - Wall assembly #184.

Item #32

1 - Wall assembly #180

Room A215

Item #33

1 - Preparation table same as specified for Item #24.

Room A303

Item #34

4 - #8W34 (8 student) tables 1 1/4" long, 34" wide, 30" high, services as cataloged with addition of 4 double air cocks. Top Kenrock. All drawers with locks and number Plates.

Item #35

1 - 5W10 Instructor's desk as cataloged.

Item #36

1 - #8338 Wall storage and display case assembly.

Room A304

Item #37

1 - Preparation table same as specified for Item #24.

Item #38

4 - #7597 Microscope Storage cases.

Room A305

Item #39

1 - Preparation table same as specified for Item #24.

Room A306

Item #40

2 - #8404 student tables as specified for Item #34.

Item #41

2 - #8484 student tables modified to six (6) student units 10'10" long with each student position having the same services as specified for Item #34.

Item #42

1 - 9410 Instructors desk as catalogued.

Item #43

1 - #8332 Wall Storage and Display Cases Assembly.

Room A310

Item #44

1 - Only #8875 Wall table assembly with [illegible] unit on right hand end.

Room A312

Item #45

4 - #8497 Student tables same as specified for Item #25.

Item #46

1 - #8330 Storage Assembly.

Item #47

1 - #8336 Storage Assembly.

Room A313

Item #48

1 - #8359 Instrument Tank as catalogued.

Room B301B

Item #49

1 - Wall Assembly #8846, 17'-7" long x 31" wide with services as catalogued. Hardwood top.

Room E3010

Item #50 3 - #0b9k and services as cataloged.

Item #51 1 - #5W10 Instructor's desk and services. Kenwood Top.

Item #52 4 - #7527 Full Height Storage Cases.

Key Case

Item #53 Install as directed one (1) #90k1 and one (1) #90k2 Key Cases with ample capacity for each Room having Sturdam Locking Drawers.

Number Plates

Install on each drawer and door of all equipment items listed above, having drawers or doors, one number plate for keyed lock marked so as to coincide with the number plates and keys each key in the above mentioned key cases in exact sequence and position as directed by the Architect.

Item No. 5 (Seating):

(a) On page 30-20, Paragraph 30-29, shall to changed to read as follows:

"Furnish and install a total of (150) one hundred and fifty tablet-arm pedestal chairs similar and equal to American Seating Company's #471 Tablet-arm pedestal chair. Secure each chair solidly in place with base plates anchored to concrete floor as recommended by the manufacturer."

Item No. 6 (Alternates):

(a) The following described alternates shall be entered on the revised proposal sheet in the space provided.

Alternate No. 1 (Colorlith Tops) (Deduct):

(a) The contractor shall show on the Proposal Sheet the amount to deduct from the Base Bid if Colorlith tops as manufactured by Johns-Manville Co. of Nashua, New Hampshire, are furnished in lieu of impregnated stone top as specified in the Base Bid.

(b) Colorlith tops shall be 1 1/4" thick consisting of a monolithic asbestos-cement sheet manufactured of a mixture of Portland Cement and carefully selected asbestos fiber subjected to an enormous hydraulic pressure, forming a dense, highly acid resistant sheet having a modulus of rupture of 3340 psi for

1 1/4" thickness. Tops shall be faunted with a clear chemical-resistant lacquer or equivalent as recommended by the manufacturer. This shall be followed by a final coat of a heavy duty acid resistant wax. All Colorlith table tops and working surfaces shall have a 1/4" wide x 3/16" deep drip groove around all exposed edges and all exposed edges shall have the corners broken to a 1/16" radius along exposed top edge and a 1/4" radius at exposed corners. Colorlith shall be as manufactured by Johns-Manville Company of Nashua, New Hampshire or equal, and shall be charcoal gray in color.

Alternate No. 2 (Seating) (ADD):

(a) The Contractor shall state on the Proposal Sheet the amount to add to the Base Bid if the American Seating Company's #7700 "Woodby" tablet-arm pedestal chair is furnished in lieu of those specified under Item No. 5 of this addendum.

RECEIPT OF THIS ADDENDUM MUST BE ACKNOWLEDGED ON THE PROPOSAL FORM.

John E. Bridi
State Architect

A D D E N D U M N O. 2

OFFICE OF STATE ARCHITECT

TOPEKA, KANSAS

November 14, 1960

NOTICE TO ALL CONTRACTORS BIDDING ON ADDITION AND ALTERATIONS - SCIENCE BUILDING, FORT HAYS KANSAS STATE COLLEGE, HAYS, KANSAS.

Gentlemen:

Please take note of the following changes in the drawings and specifications for the subject project:

GENERAL CONTRACT

Item No. 1 (Acoustical Treatment):

(a) On page 22-1, Paragraph 22-3, sub-paragraph (a) shall be changed as follows:

"(a) Wood or cane fiber or glass fiber tile shall be of a fissured pattern, having a noise reduction coefficient of .65 for A.S.A. mounting #7. This material shall be not less than 3/4" thick in 23 3/4" x 47 3/4" units. Tile shall be similar and equal to Simpsons "Formatone" or Gustin-Bacon, "C-3 Ultratone".

Item No. 2 (Mechanical Suspension System):

(a) On page 22-2, Paragraph 22-4, shall be changed as follows:

"(a) Acoustical tile shall be installed on an exposed T-bar grid suspension system similar and equal to "System A" as manufactured by the Western Products Corp., Baltimore, Maryland."

(b) Main runner shall be hung using No. 9 galvanized wire at not more than 4'-0" c.c. or in accordance with manufacturers recommendations.

(c) Exposed cross tees of proper length shall be installed at right angles to the main runner so as to create a grid 24" x 48" c. c.

(d) Exposed flanges of perimeter molding and suspension flanges shall be factory finished in white enamel.

ELEVATOR CONTRACT

Item No. 3 (Car & Hoistway Door Operator):

(a) On page 26-5, Paragraph 26-29, omit sub-paragraph (c).

A D D E N D U M N O. 2

OFFICE OF STATE ARCHITECT

TOPEKA, KANSAS

November 8, 1960

NOTICE TO ALL CONTRACTORS BIDDING ON ADDITION AND ALTERATIONS TO SCIENCE BUILDING, FORT HAYS KANSAS STATE COLLEGE, HAYS, KANSAS.

Gentlemen:

Please take note of the following changes in the drawings and specifications for the subject project:

Item No. 1 (Metal Door Frames):

(a) All metal door frames in walls over 8" thick shall be butt type frames and shall be 5 1/8" in width.

Item No. 2 (Laboratory Equipment):

(a) On page 30-11, Paragraph 30-24, sub-paragraph (a) shall be changed as follows:

"(a) Colorlith Tops: Colorlith tops shall be 1 1/4" thick consisting of a monolithic asbestos-cement sheet manufactured of a mixture of Portland Cement and carefully selected asbestos fiber subjected to an enormous hydraulic pressure, forming a dense, highly acid resistant sheet having a modulus of rupture of 3340 psi for 1 1/4" thickness. Tops shall be treated with a clear chemical-resistant lacquer or equivalent as recommended by the manufacturer. This shall be followed by a final coat of a heavy duty acid resistant wax. All Colorlith table tops and working surfaces shall have a 1/4" wide x 3/16" deep drip groove around all exposed edges and all exposed edges shall have the corners broken to a 1/16" radius along exposed top edge and a 1/4" radius at exposed corners. Colorlith shall be as manufactured by Johns-Manville Company of Nashua, New Hampshire or equal, and shall be charcoal gray in color."

(b) Paragraph 30-26 - Equipment Schedule, All references to impregnated natural stone tops shall be revised to conform with the above change.

(c) Chemical Resistance Tests shall remain as specified.

RECEIPT OF THIS ADDENDUM MUST BE ACKNOWLEDGED ON THE PROPOSAL FORM.

John E. Brink
State Architect

ADDENDUM NO. 1

OFFICE OF STATE ARCHITECT

November 7, 1960

NOTICE TO ALL CONTRACTORS BIDDING ON ADDITION & ALTERATIONS SCIENCE BUILDING, FORT HAYS KANSAS STATE COLLEGE, HAYS, KANSAS

Gentlemen:

Please take note of the following changes in the specifications and drawings for the subject project:

Item #1 (Irrigation Piping)

(a) The plumbing contractor shall furnish and install 4" irrigation piping as shown on the drawings. Irrigation piping shall be Schedule 40, black steel pipe, with welding fittings. Existing pipe in site location shall be removed where indicated on the drawings. All existing pipe removed shall remain the property of the State. The piping in tunnels shall be painted as specified under painting.

RECEIPT OF THIS ADDENDUM MUST BE ACKNOWLEDGED ON THE PROPOSAL FORM.

John E. Brink
State Architect

Addition and Alterations to Science Building

Fort Hays Kansas State College
Hays, Kansas

Bids Taken: Nov. 17 1960

General Construction

	Haskard, Inc. Box 82 Hutchinson, Kns.	Hunter Const. Co. Inc. Box 622 Hays, Kns.	Ross & Cale, Inc. 310 Ida Wichita, Kns.	L. R. Foy Const. Co., Inc. 234 W. 4th Hutchinson, Kns.	Hahner-Foreman-Cale, Inc. Box 505 Great Bend, Kns.
Base Bid	$740,000.00	$853,000.00	$256,926.00	$265,339.00	$269,900.00
Alt. #1 deduct	2,500.00	3,016.00	1,000.00	2,913.00	3,642.00
Alt. #2 deduct	600.00	4,042.00	3,800.00	3,725.00	1,776.00
Alt. #3 deduct	1,100.00	1,263.00	300.00	482.00	945.00
Alt. #4 deduct	500.00	1,100.00	no change	1,047.00	569.00
Alt. #5 deduct	1,000.00	1,415.00	850.00	636.00	671.00
Alt. #6 deduct	450.00	519.00	425.00	440.00	421.00
Alt. #7 add	600.00	1,240.00	200.00	732.00	742.00
Alt. #8 add	900.00	843.00	460.00	820.00	968.00
Alt. #9 add	1,100.00	1,138.00	1,300.00	2,360.00	1,163.00

reject

accept

Unit Prices	Add	Deduct	Add	Deduct	Add	Deduct	Add	Deduct	Add	Deduct
gen. excav./cy	2.00	1.00	1.00	.50	1.50	.50	1.25	.75	1.00	.50
ment. encl. excav./cy	5.00	4.00	4.00	2.00	7.00	4.00	6.00	4.00	6.00	4.00
gen. conc. wk/cy	60.00	55.00	50.00	30.00	65.00	25.00	90.00	65.00	65.00	45.00
plain conc. wk/cy	40.00	15.00	60.00	20.00	30.00	15.00	75.00	50.00	45.00	35.00
C. D. from date of written work order	360		300		270		340		420	

Fort Hays Kansas State College
Hays, Kansas

Bids Taken: Nov. 17, 1960

Gen. Const. Work Cont'd.

	Bushoom & Rauh 109 E. Iron Salina, Kns.	Cave Const. Co. Inc. 6631 E. Kellogg Wichita, Kns.
Base Bid	$271,110.00	$279,000.00
Alt. #1 deduct	3,100.00	3,000.00
Alt. #2 deduct	3,350.00	3,600.00
Alt. #3 deduct	975.00	300.00
Alt. #4 deduct	700.00	750.00
Alt. #5 deduct	1,160.00	990.00
Alt. #6 deduct	475.00	530.00
Alt. #7 add	675.00	750.00
Alt. #8 add	825.00	775.00
Alt. #9 add	2,290.00	1,200.00

Unit Prices	Add	Deduct	Add	Deduct
gen earth excav/cy	1.25	.35	2.60	.45
unat earth excav/cy	5.00	2.00	7.00	2.50
gen conc, wk/cy	72.00	36.00	80.00	20.00
plain conc, wk/cy	22.00	16.00	22.00	14.00
C. D. from date of written work order	375		360	

Fort Hays Kansas State College
Hays, Kansas

Bids Taken: Nov. 17, 1960

Plumbing, Heating, Ventilating and Air Conditioning Work

	Kendall Plbg. Inc. 1647 Laura Wichita, Kns.	Davidson & Assoc. Inc. 1123 E. Waterman Wichita, Kns.	Stevens Inc. 225 S. Main Hutchinson, Kansas	Geren & Co. Inc. 535 N. Washington Wichita, Kns.	Ed Classman Htg. & Air Cond. 615 E. 19th Hays, Kns.
Base Bid	$119,000.00	$119,686.00	$122,253.00	$126,834.00	$134,738.00
Alt. #M-1	- 7,342.00 reject	- 7,247.00	- 3,785.00	- 6,050.00	- 10,000.00
Alt. #M-2	+ 1,291.00 } accept	+ 1,342.00	+ 1,097.00	+ 2,500.00	- 200.00
Alt. #M-3	+ 3,645.00 }	+ 3,690.00	+ 3,950.00	+ 3,500.00	+ 3,537.00
Alt. #M-4	- 388.00 } reject	- 475.00	- 500.00	- 710.00	- 1,000.00
Alt. #M-5	- 1,300.00 }	- 375.00	- 1,240.00	- 410.00	- 300.00
C. D. from date of written work order	same as gen.	with general	with general	with general	- - -

	Midland, Inc. Box 408 Hays, Kns.	Paul Trent Plbg. Box 479 Pratt, Kan.	Buckley Const. Industries 1600 E. Murdock Wichita, Kns.
Base Bid	$151,360.00	$162,300.00	$165,200.00
Alt. #M-1	- 5,600.00	- 6,000.00	- 5,225.00
Alt. #M-2	+ 1,450.00	+ 1,700.00	+ 2,000.00
Alt. #M-3	+ 4,600.00	+ 5,500.00	+ 5,150.00
Alt. #M-4	- 900.00	- 850.00	- 779.00
Alt. #M-5	- 1,050.00	- 1,000.00	- 997.00
C. D.	with general	- - - -	in conformance with job

Addition and Alterations to Science Building

Fort Hays Kansas State College
Hays, Kansas

Bids Taken: Nov. 17, 1960

Electrical Work

	Mill Elect. Co. Inc. 2936 E. Douglas Wichita, Kns.	Amerine Elect. Co. 2201 Harrison Great Bend, Kns.	Electrical Service Co. 519 N. Main Hutchinson, Kns.	Koeppen Elect. Co. Box 1221 Hutchinson, Kns.
Base Bid	$31,920.00	$36,932.00	$36,961.00	$37,300.00
Alt. #E-1 deduct	1,900.00 reject	2,236.00	1,805.11	1,200.00
Alt. #E-2 add	100.00 } accept	116.00	208.00	200.00
Alt. #E-3 add	100.00	126.00	247.00	200.00
Alt. #E-4 deduct	30.00 reject	66.00	30.00	200.00
Alt. #E-5 add	1,730.00 accept,	2,059.00	660.00	1,850.00
C. D. from date of work order	260	with general	with general	with general

Fort Hays Kansas State College
Hays, Kansas

Bids Taken: Nov. 17, 1949

Elevator Work

	Allied Elevator Co. 810 S.W. Blvd. K.C. 6, Mo.	Anderson-Priest Elevator Co. 1316 McGee St. K.C. 6, Mo.	Elevator Sales & Service, Inc. 2510 Truman Rd. K.C. Mo.	Montgomery Elevator Co. 30 20th St. Moline, Ill.	Otis Elevator Co. 2301 Locust St. St. Louis, Mo.
Base Bid	$9,950.00	$10,847.00	$11,096.00	$11,668.00	$12,959.00
C.D. from date of written work order	180	150	160	130	220 ** see proposal form

CERTIFIED CHECK SHOULD BE ATTACHED HERE, IF FURNISHED WITH THIS PROPOSAL IN LIEU OF BOND.

Req. No. A61-071

GENERAL CONSTRUCTION WORK

PROPOSAL

Fort Hays Kansas State College — Hays, Kansas

State of Kansas
H. H. Knouft, Director
Purchasing Division
Department of Administration
State Office Building
Topeka, Kansas

Gentlemen:

The undersigned agrees to furnish all labor, materials, equipment and appliances, and perform all operations in connection with the general construction work for the construction of an Addition and Alterations to Science Building, on the grounds of Fort Hays Kansas State College, Hays, Kansas, in strict accordance with plans and specifications issued by the State Architect for the sum of:

_____

_____ ($_____)

We will make additions to or deductions from the contract in accordance with the alternate specifications as follows:

		Price
Alternate No. 1	(Deduct)	$_____
Alternate No. 2	(Deduct)	$_____
Alternate No. 3	(Deduct)	$_____
Alternate No. 4	(Deduct)	$_____
Alternate No. 5	(Deduct)	$_____
Alternate No. 6	(Deduct)	$_____
Alternate No. 7	(Add or Deduct)	$_____
Alternate No. 8	(Add)	$_____
Alternate No. 9	(Add)	$_____

Req. No. A61-071

We bid the following unit prices to be used in negotiating change orders which may arise during the course of construction.

Description of Work	Unit	Additions	Deductions
General Earth Excavation	cu.yd.	$_____	$_____
Neat Earth Excavation	cu.yd.	$_____	$_____
General Concrete Work	cu.yd.	$_____	$_____
Plain Concrete Work	cu.yd.	$_____	$_____

The undersigned agrees to complete the general construction work in _____ calendar days from the date of the written work order.

The undersigned acknowledges receipt of the following addenda in connection with the work: _____.

The undersigned hereby declares that he has carefully examined the plans and specifications and visited the actual location of the work, together with the sources of supply, and has satisfied himself as to all quantities and conditions, and understands that in signing this proposal, he waives all right to plead any misunderstanding regarding the same.

The undersigned hereby certifies that the bidder is not in arrears in taxes due the State of Kansas.

The undersigned hereby agrees to the following:

1. That an incomplete proposal or other information not requested, written on this proposal, may be cause for rejection.

2. That he has read the Notice to Contractors and Instructions to Bidders carefully.

3. That all submittal data required by the specifications to be submitted with the proposal, together with all other data submitted by the Bidder, become an integral part of the proposal and will be a consideration in making the award.

Dated this _____ day of _____, 1960.

(Name of Bidder) _____ (Address of Bidder) _____

(Authorized Officer) _____ (Title) _____

CERTIFIED CHECK SHOULD BE ATTACHED HERE, IF FURNISHED WITH THIS PROPOSAL IN LIEU OF BOND.

Req. No. A61-071

LABORATORY EQUIPMENT

PROPOSAL

Fort Hays Kansas State College — Hays, Kansas

State of Kansas
H. H. Knouft, Director
Purchasing Division
Department of Administration
State Office Building
Topeka, Kansas

Gentlemen:

The undersigned agrees to furnish all labor, materials, equipment and appliances, and perform all operations in connection with the Laboratory Equipment for the Addition and Alterations to Science Building, located on the grounds of the Fort Hays Kansas State College, Hays, Kansas, in strict accordance with plans and specifications issued by the State Architect for the sum of:

_____

_____ ($_____)

We will make additions to or deductions from the contract in accordance with the alternate specifications as follows:

Alternate (Add or Deduct) $_____

Alternate (Add or Deduct) $_____

The undersigned agrees to complete all laboratory equipment work in _____ calendar days after all areas in the building are completed and ready for installation.

The undersigned acknowledges receipt of the following addenda in connection with the work: _____.

The undersigned hereby declares that he has carefully examined the plans and specifications and visited the actual location of the work, together with the sources of supply, and has satisfied himself as to all quantities and conditions, and understands that in signing this proposal, he waives all right to plead any misunderstanding regarding the same.

The undersigned hereby certifies that the bidder is not in arrears in taxes due the State of Kansas.

The undersigned hereby agrees to the following:

1. That an incomplete proposal or other information not requested, written on this proposal, may be cause for rejection.

2. That he has read the Notice to Contractors and Instructions to Bidders carefully.

3. That all submittal data required by the specifications to be submitted with the proposal, together with all other data submitted by the Bidder, become an integral part of the proposal and will be a consideration in making the award.

Dated this _____ day of _____, 1960.

_____
(Name of Bidder)

_____
(Address of Bidder)

_____
(Authorized Officer)

_____
(Title)

CERTIFIED CHECK SHOULD BE ATTACHED HERE, IF FURNISHED WITH THIS PROPOSAL IN LIEU OF BOND.

Req. No. A61-071

ELECTRICAL WORK

PROPOSAL

Fort Hays Kansas State College — Hays, Kansas

State of Kansas
H. H. Knouft, Director
Purchasing Division
Department of Administration
State Office Building
Topeka, Kansas

Gentlemen:

The undersigned agrees to furnish all labor, materials, equipment and appliances, and perform all operations in connection with the Electrical Work for an Addition and Alterations to Science Building, located on the grounds of the Fort Hays Kansas State College, Hays, Kansas, in strict accordance with plans and specifications issued by the State Architect for the sum of:

_____

_____ ($_____)

We will make additions to or deductions from the contract in accordance with the alternate specifications as follows:

Alternate No. E-1	(Deduct)	$_____
Alternate No. E-2	(Add)	$_____
Alternate No. E-3	(Add)	$_____
Alternate No. E-4	(Deduct)	$_____
Alternate No. E-5	(Add)	$_____
Alternate	(Add or Deduct)	$_____

The undersigned agrees to complete the Electrical Work in _____ calendar days from the date of the written work order.

The undersigned acknowledges receipt of the following addenda in connection with the work: _____.

The undersigned hereby declares that he has carefully examined the plans and specifications and visited the actual location of the work, together with the

sources of supply, and has satisfied himself as to all quantities and conditions, and understands that in signing this proposal, he waives all right to plead any misunderstanding regarding the same.

The undersigned hereby certifies that the bidder is not in arrears in taxes due the State of Kansas.

The undersigned hereby agrees to the following:

1. That an incomplete proposal or other information not requested, written on this proposal, may be cause for rejection.

2. That he has read the Notice to Contractors and the Instructions to Bidders carefully.

3. That all submittaldata required by the specifications to be submitted with the proposal, together with all other data submitted by the Bidder, become an integral part of the proposal and will be a consideration in making the award.

Dated this _____ day of _____, 1960.

_____
(Name of Bidder)

_____
(Address of Bidder)

_____
(Authorized Officer)

_____
(Title)

CERTIFIED CHECK SHOULD BE ATTACHED HERE, IF FURNISHED WITH THIS PROPOSAL IN LIEU OF BOND.

Req. No. A61-071

PLUMBING, HEATING, VENTILATING
AND
AIR CONDITIONING WORK

PROPOSAL

Fort Hays Kansas State College — Hays, Kansas

State of Kansas
H. H. Knouft, Director
Purchasing Division
Department of Administration
State Office Building
Topeka, Kansas

Gentlemen:

The undersigned agrees to furnish all labor, materials, equipment and appliances, and perform all operations in connection with the Plumbing, Heating, Ventilating and Air Conditioning Work for an Addition and Alterations to Science Building, located on the grounds of the Fort Hays Kansas State College, Hays, Kansas, in strict accordance with plans and specifications issued by the State Architect for the sum of:

_____

_____ ($_____)

We will make additions to or deductions from the contract in accordance with the alternate specifications as follows:

Alternate No. M-1	(Deduct)	$_____
Alternate No. M-2	(Deduct)	$_____
Alternate No. M-3	(Add)	$_____
Alternate No. M-4	(Deduct)	$_____
Alternate No. M-5	(Deduct)	$_____
Alternate	(Add or Deduct)	$_____

The undersigned agrees to complete the Plumbing, Heating, Ventilating and Air Conditioning Work in _____ calendar days from the date of the written work order.

The undersigned acknowledges receipt of the following addenda in connection with the work: _____.

Req. No. A61-071

The undersigned hereby declares that he has carefully examined the plans and specifications and visited the actual location of the work, together with the sources of supply, and has satisfied himself as to all quantities and conditions, and understands that in signing this proposal, he waives all right to plead any misunderstanding regarding the same.

The undersigned hereby certifies that the bidder is not in arrears in taxes due the State of Kansas.

The undersigned hereby agrees to the following:

1. That an incomplete proposal or other information not requested, written on this proposal, may be cause for rejection.

2. That he has read the Notice to Contractors and the Instructions to Bidders carefully.

3. That all submittal data required by the specifications to be submitted with the proposal, together with all other data submitted by the Bidder, become an integral part of the proposal and will be a consideration in making the award.

Dated this _____ day of _____, 1960.

_____
(Name of Bidder)

_____
(Address of Bidder)

_____
(Authorized Officer)

_____
(Title)

SPECIFICATIONS

FOR

ADDITION & ALTERATIONS

SCIENCE BUILDING

Fort Hays Kansas State College — Hays, Kansas

T. Marion Hoter
Associate Architect
Sterling, Kansas

John E. Brink
State Architect
Topeka, Kansas

FHKSC:166
10-17-60
Req. #A61-071

ADDITION & ALTERATIONS

SCIENCE BUILDING

Fort Hays Kansas State College — Hays, Kansas

CONTENTS

NOTE: Each bidder shall check the specifications and advise the State Architect if any pages are missing.

CERTIFIED CHECK SHOULD BE ATTACHED HERE, IF FURNISHED WITH THIS PROPOSAL IN LIEU OF BOND.

Req. No. A61-071

GENERAL CONSTRUCTION WORK

PROPOSAL

Fort Hays Kansas State College — Hays, Kansas

State of Kansas
H. H. Knouft, Director
Purchasing Division
Department of Administration
State Office Building
Topeka, Kansas

Gentlemen:

The undersigned agrees to furnish all labor, materials, equipment and appliances, and perform all operations in connection with the general construction work for the construction of an Addition and Alterations to Science Building, on the grounds of Fort Hays Kansas State College, Hays, Kansas, in strict accordance with plans and specifications issued by the State Architect for the sum of:

_____

_____ ($_____)

We will make additions to or deductions from the contract in accordance with the alternate specifications as follows:

		Price
Alternate No. 1	(Deduct)	$_____
Alternate No. 2	(Deduct)	$_____
Alternate No. 3	(Deduct)	$_____
Alternate No. 4	(Deduct)	$_____
Alternate No. 5	(Deduct)	$_____
Alternate No. 6	(Deduct)	$_____
Alternate No. 7	(Add or Deduct)	$_____
Alternate No. 8	(Add)	$_____
Alternate No. 9	(Add)	$_____

Req. No. A61-071

We bid the following unit prices to be used in negotiating change orders which may arise during the course of construction.

Description of Work	Unit	Additions	Deductions
General Earth Excavation	cu.yd.	$_____	$_____
Neat Earth Excavation	cu.yd.	$_____	$_____
General Concrete Work	cu.yd.	$_____	$_____
Plain Concrete Work	cu.yd.	$_____	$_____

The undersigned agrees to complete the general construction work in _____ calendar days from the date of the written work order.

The undersigned acknowledges receipt of the following addenda in connection with the work: _____.

The undersigned hereby declares that he has carefully examined the plans and specifications and visited the actual location of the work, together with the sources of supply, and has satisfied himself as to all quantities and conditions, and understands that in signing this proposal, he waives all right to plead any misunderstanding regarding the same.

The undersigned hereby certifies that the bidder is not in arrears in taxes due the State of Kansas.

The undersigned hereby agrees to the following:

1. That an incomplete proposal or other information not requested, written on this proposal, may be cause for rejection.

2. That he has read the Notice to Contractors and Instructions to Bidders carefully.

3. That all submittal data required by the specifications to be submitted with the proposal, together with all other data submitted by the Bidder, become an integral part of the proposal and will be a consideration in making the award.

Dated this _____ day of _____, 1960.

(Name of Bidder) _____ (Address of Bidder) _____

(Authorized Officer) _____ (Title) _____

CERTIFIED CHECK SHOULD BE ATTACHED HERE, IF FURNISHED WITH THIS PROPOSAL IN LIEU OF BOND.

Req. No. A61-071

LABORATORY EQUIPMENT

PROPOSAL

Fort Hays Kansas State College — Hays, Kansas

State of Kansas
H. H. Knouft, Director
Purchasing Division
Department of Administration
State Office Building
Topeka, Kansas

Gentlemen:

The undersigned agrees to furnish all labor, materials, equipment and appliances, and perform all operations in connection with the Laboratory Equipment for the Addition and Alterations to Science Building, located on the grounds of the Fort Hays Kansas State College, Hays, Kansas, in strict accordance with plans and specifications issued by the State Architect for the sum of:

_____

_____ ($_____)

We will make additions to or deductions from the contract in accordance with the alternate specifications as follows:

Alternate (Add or Deduct) $_____

Alternate (Add or Deduct) $_____

The undersigned agrees to complete all laboratory equipment work in _____ calendar days after all areas in the building are completed and ready for installation.

The undersigned acknowledges receipt of the following addenda in connection with the work: _____.

The undersigned hereby declares that he has carefully examined the plans and specifications and visited the actual location of the work, together with the sources of supply, and has satisfied himself as to all quantities and conditions, and understands that in signing this proposal, he waives all right to plead any misunderstanding regarding the same.

The undersigned hereby certifies that the bidder is not in arrears in taxes due the State of Kansas.

The undersigned hereby agrees to the following:

1. That an incomplete proposal or other information not requested, written on this proposal, may be cause for rejection.

2. That he has read the Notice to Contractors and Instructions to Bidders carefully.

3. That all submittal data required by the specifications to be submitted with the proposal, together with all other data submitted by the Bidder, become an integral part of the proposal and will be a consideration in making the award.

Dated this _____ day of _____, 1960.

_____
(Name of Bidder)

_____
(Address of Bidder)

_____
(Authorized Officer)

_____
(Title)

CERTIFIED CHECK SHOULD BE ATTACHED HERE, IF FURNISHED WITH THIS PROPOSAL IN LIEU OF BOND.

Req. No. A61-071

ELEVATOR WORK

PROPOSAL

Fort Hays Kansas State College — Hays, Kansas

State of Kansas
H. H. Knouft, Director
Purchasing Division
Department of Administration
State Office Building
Topeka, Kansas

Gentlemen:

The undersigned agrees to furnish all labor, materials, equipment and appliances, and perform all operations in connection with the installation of Hydraulic Elevator Work for an Addition and Alterations to Science Building, located on the grounds of the Fort Hays Kansas State College, Hays, Kansas, in strict accordance with plans and specifications issued by the State Architect for the sum of:

_____

_____ ($_____)

We will make additions to or deductions from the contract in accordance with the alternate specifications as follows:

Alternate _____ (Add or Deduct) $_____

The undersigned agrees to complete the Elevator Work in _____ calendar days from the date of the written work order.

The undersigned acknowledges receipt of the following addenda in connection with the work: _____.

The undersigned hereby declares that he has carefully examined the plans and specifications and visited the actual location of the work, together with the sources of supply, and has satisfied himself as to all quantities and conditions, and understands that in signing this proposal, he waives all right to plead any misunderstanding regarding the same.

The undersigned hereby certifies that the bidder is not in arrears in taxes due the State of Kansas.

The undersigned hereby agrees to the following:

Req. No. A61-071

1. That an incomplete proposal or other information not requested, written on this proposal, may be cause for rejection.

2. That he has read the Notice to Contractors and Instructions to Bidders carefully.

3. That all submittal data required by the specifications to be submitted with the proposal, together with all other data submitted by the Bidder, become an integral part of the proposal and will be a consideration in making the award.

Dated this _____ day of _____, 1960.

_____
(Name of Bidder)

_____
(Address of Bidder)

_____
(Authorized Officer)

_____
(Title)

CERTIFIED CHECK SHOULD BE ATTACHED HERE, IF FURNISHED WITH THIS PROPOSAL IN LIEU OF BOND.

Req. No. A61-071

ELECTRICAL WORK

PROPOSAL

Fort Hays Kansas State College — Hays, Kansas

State of Kansas
H. H. Knouft, Director
Purchasing Division
Department of Administration
State Office Building
Topeka, Kansas

Gentlemen:

The undersigned agrees to furnish all labor, materials, equipment and appliances, and perform all operations in connection with the Electrical Work for an Addition and Alterations to Science Building, located on the grounds of the Fort Hays Kansas State College, Hays, Kansas, in strict accordance with plans and specifications issued by the State Architect for the sum of:

_____

_____ ($_____)

We will make additions to or deductions from the contract in accordance with the alternate specifications as follows:

Alternate No. E-1	(Deduct)	$_____
Alternate No. E-2	(Add)	$_____
Alternate No. E-3	(Add)	$_____
Alternate No. E-4	(Deduct)	$_____
Alternate No. E-5	(Add)	$_____
Alternate	(Add or Deduct)	$_____

The undersigned agrees to complete the Electrical Work in _____ calendar days from the date of the written work order.

The undersigned acknowledges receipt of the following addenda in connection with the work: _____.

The undersigned hereby declares that he has carefully examined the plans and specifications and visited the actual location of the work, together with the

sources of supply, and has satisfied himself as to all quantities and conditions, and understands that in signing this proposal, he waives all right to plead any misunderstanding regarding the same.

The undersigned hereby certifies that the bidder is not in arrears in taxes due the State of Kansas.

The undersigned hereby agrees to the following:

1. That an incomplete proposal or other information not requested, written on this proposal, may be cause for rejection.

2. That he has read the Notice to Contractors and the Instructions to Bidders carefully.

3. That all submittal data required by the specifications to be submitted with the proposal, together with all other data submitted by the Bidder, become an integral part of the proposal and will be a consideration in making the award.

Dated this _____ day of _____, 1960.

_____
(Name of Bidder)

_____
(Address of Bidder)

_____
(Authorized Officer)

_____
(Title)

CERTIFIED CHECK SHOULD BE ATTACHED HERE, IF FURNISHED WITH THIS PROPOSAL IN LIEU OF BOND.

Req. No. A61-071

PLUMBING, HEATING, VENTILATING
AND
AIR CONDITIONING WORK

PROPOSAL

Fort Hays Kansas State College Hays, Kansas

State of Kansas
H. H. Knouff, Director
Purchasing Division
Department of Administration
State Office Building
Topeka, Kansas

Gentlemen:

The undersigned agrees to furnish all labor, materials, equipment and appliances, and perform all operations in connection with the Plumbing, Heating, Ventilating and Air Conditioning Work for an Addition and Alterations to Science Building, located on the grounds of the Fort Hays Kansas State College, Hays, Kansas, in strict accordance with plans and specifications issued by the State Architect for the sum of:

_____

_____ ($_____)

We will make additions to or deductions from the contract in accordance with the alternate specifications as follows:

Alternate No. M-1	(Deduct)	$_____
Alternate No. M-2	(Deduct)	$_____
Alternate No. M-3	(Add)	$_____
Alternate No. M-4	(Deduct)	$_____
Alternate No. M-5	(Deduct)	$_____
Alternate	(Add or Deduct)	$_____

The undersigned agrees to complete the Plumbing, Heating, Ventilating and Air Conditioning Work in _____ calendar days from the date of the written work order.

The undersigned acknowledges receipt of the following addenda in connection with the work: _____.

Req. No. A61-071

The undersigned hereby declares that he has carefully examined the plans and specifications and visited the actual location of the work, together with the sources of supply, and has satisfied himself as to all quantities and conditions, and understands that in signing this proposal, he waives all right to plead any misunderstanding regarding the same.

The undersigned hereby certifies that the bidder is not in arrears in taxes due the State of Kansas.

The undersigned hereby agrees to the following:

1. That an incomplete proposal or other information not requested, written on this proposal, may be cause for rejection.

2. That he has read the Notice to Contractors and the Instructions to Bidders carefully.

3. That all submittal data required by the specifications to be submitted with the proposal, together with all other data submitted by the Bidder, become an integral part of the proposal and will be a consideration in making the award.

Dated this _____ day of _____, 1960.

_____
(Name of Bidder)

_____
(Address of Bidder)

_____
(Authorized Officer)

_____
(Title)

OFFICE OF STATE ARCHITECT

TOPEKA, KANSAS

GENERAL CONDITIONS OF THE CONTRACT

SECTION I

1. APPLICATION:

(*a*) The General Conditions, Drawings and Specifications, including all modifications thereof incorporated in the Contract Documents before their execution, shall form the contract and shall govern in the performance of the work under this contract.

2. PRINCIPLES:

(*a*) Each Contractor bidding on this work shall visit the site and familiarize himself with all conditions before submitting his bid. No allowance will be made for omissions and errors due to failure of the Contractor to acquaint himself with existing conditions affecting the contract.

(*b*) The Contractor must comply with all conditions of the Form of Bid. Any omission will be considered grounds for rejection of the bid.

(*c*) In submitting a bid, the Contractor agrees to carry out all the provisions of the drawings and specifications.

(*d*) The Owner reserves the right to waive all formalities and reject any or all bids.

(*e*) The Owner reserves the right to let other contracts in connection with the work and the Contractor shall properly co-operate with any such other contractors.

3. DEFINITIONS:

(*a*) The Owner is the State of Kansas through the Director of Purchases, or other legally delegated agency.

(*b*) The Architect is the duly authorized Architect of the State of Kansas or his representative.

(*c*) The Contractor is a person or persons who will contract with the Owner for work.

(*d*) The term "work" of the Contractor includes labor or materials or both.

4. DUTIES OF ARCHITECT:

(*a*) The Architect shall furnish the Contractor with all necessary drawings, details, and specifications for the work, including all needed explanations.

(*b*) The Architect shall direct the manner of executing the work, decide upon the fitness of materials, and reject any work and materials that in his judgment do not fulfill the requirements of the contract.

(*c*) The Architect shall settle all matters or disputes relative to the execution of the work and the interpretation of the drawings and specifications.

(*d*) The Architect has the authority to direct incompetent workmen to do other work or to have them discharged.

(*e*) The Architect has the authority to have any work not properly done, taken down and rebuilt and have rejected materials removed from the premises.

5. INTENT OF DOCUMENTS:

(*a*) The Contract Documents, including general conditions of the contract, drawings and specifications, are complementary, and what is called for in one shall be as binding as if called for by all.

(*b*) The intention of the documents is to include all labor and materials, equipment and transportation necessary for the proper and complete execution of the work, unless specifically stated otherwise.

(*c*) The interpretation of the drawings and specifications will be made in the following order: (1) Addenda or Bulletins to the specifications; (2) Specifications; (3) Drawings. On the drawings, schedules shall take precedence over other data, and figured dimensions shall have preference to scaled dimensions.

(*d*) The Contractor shall verify all dimensions on the drawings and be responsible for same.

(*e*) Any apparent discrepancy in either the drawings or the specifications shall be promptly reported to the Architect.

6. BONDS:

(*a*) Performance bond shall be furnished the Owner by the Contractor in the amount equal to one hundred percent (100%) of the contract price as security for the faithful performance of this contract and for the payment of all persons performing labor and furnishing materials in connection with this contract. Bond shall be with a surety company licensed to do business in the State of Kansas.

(*b*) Statutory bond shall be furnished to the Owner by the Contractor in the amount of one hundred percent (100%) of the contract price and shall be filed by the contractor with the Clerk of the District Court in the county where the building is being constructed. No work shall be done until these conditions have been complied with.

7. PROOF OF INSURANCE:

(*a*) The Contractor shall furnish the Owner with satisfactory proof that the insurance herein described has been obtained. All insurance costs are to be paid by the Contractor.

(*b*) Work of Contractor or his sub-contractors shall not commence under this contract until all insurance required has been obtained and approved.

8. WORKMEN'S COMPENSATION INSURANCE:

(*a*) Workmen's Compensation Insurance shall be obtained and maintained by the Contractor for all his employees at the project site for the duration of this contract.

(*b*) The Contractor shall require all sub-contractors under this contract to provide Workmen's Compensation Insurance for their employees unless such employees are covered by the protection offered by the Contractor.

(*c*) Employees of the Contractor and sub-contractors engaged in hazardous work under this contract at the project site, and not protected by Workmen's Compensation Statute, shall be protected by adequate and suitable insurance provided by the Contractor and sub-contractors.

9. BODILY INJURY AND PROPERTY DAMAGE INSURANCE:

(*a*) Bodily Injury Liability Insurance and Property Damage Insurance shall be obtained and maintained by the Contractor for the duration of this contract. This insurance shall protect the Contractor and sub-contractors from claims for damages for personal injury, including accidental death, and from claims for property damages which may arise from operations under this contract, whether such operations be by himself or by any sub-contractor or anyone directly or indirectly employed by either of them. The amounts of such insurance shall not be less than:

(1) Bodily Injury Liability Insurance, in an amount not less than Fifty Thousand Dollars ($50,000.00) for injuries, including wrongful death to any one person, and subject to the same limit for each person in an amount not less than One Hundred Thousand Dollars ($100,000.00) on account of one accident.

(2) Property Damage Insurance in an amount not less than Ten Thousand Dollars ($10,000.00) for damages on account of any one accident, and in an amount not less than Twenty-Five Thousand Dollars ($25,000.00) for damages on account of all accidents.

10. FIRE AND EXTENDED COVERAGE INSURANCE:

(*a*) All work under contract for new buildings and building additions shall be insured by the Contractor against loss by fire and extended coverage, in amounts equal to 100% the value thereof from time to time, and until its completion and acceptance. The insurance shall be on a completed or reporting basis. The insured shall be the Contractor and the State of Kansas.

(*b*) Work under contracts for remodeling and repair work in existing buildings and contracts for paving, sewers, grading, etc., not subject to this type of damage need not be insured against loss by fire and extended coverage.

11. CONTRACTOR'S RESPONSIBILITY:

(*a*) The Contractor shall be wholly responsible under this contract for its faithful execution.

(*b*) The work shall be under the supervision of a competent man skilled in all the main departments of the work. He shall have technical knowledge of the drawings and methods of workmanship. He shall be at the project site at all times when work is in progress to receive instructions and give directions to the workmen.

(*c*) The Contractor shall be responsible for care and protection of the work, for improvements covered by the contract, and for all materials and apparatus on the project premises until the work is completed and accepted by the Owner.

(*d*) The Contractor shall adequately protect adjacent property as provided by law, the drawings and the specifications.

12. SAFETY:

(*a*) Precaution shall be exercised at all times for the protection of persons (including employees) and property. The safety provisions of applicable laws, building and construction codes shall be observed. Machinery, equipment, and hazards shall be guarded, and all hazards shall be guarded or eliminated in accordance with the safety provisions of the Manual of Accident Prevention in Construction, published by the Associated General Contractors of America, to the extent that such provisions are not in contravention of applicable law.

(*b*) Workmen shall not ride on construction hoists.

13. TESTS:

(*a*) Wherever the specifications specifically call for tests of material or work, the expense of such tests shall be borne by the Contractor.

14. PATENTS:

(*a*) The Contractor shall pay all royalties and license fees on all patent or patent-pending articles, methods and devices which involves or requires the payment of any license fee or royalty in addition to the purchase price.

(*b*) The Contractor shall defend all suits and claims for infringement of patent rights and shall save the Owner harmless from loss on account of such suits and claims.

15. SHOP DRAWINGS:

(*a*) The Contractor shall submit three copies each of all shop drawings, setting drawings and schedules required for the work of the various trades. The Architect shall pass upon them with reasonable promptness. The Contractor shall make any corrections required by the Architect, file with him three corrected copies for final approval and furnish such additional copies as may be needed.

(*b*) The Architects approval of such drawings or schedules shall not relieve the contractor from responsibility for deviation from drawings or specifications unless he has in writing called the Architects attention to such deviations at the time of the submission, nor shall it relieve him from responsibility for errors of any sort in shop drawings or schedules.

16. EIGHT-HOUR DAY ON PUBLIC WORK:

(*a*) Section 44-201 of the Revised Statutes of Kansas for 1949 reads as follows: "Eight-hour day; payment of current rate of per diem wages where work performed." 'The current rate of per diem wages' for the intent and purposes of this act shall be the rate of wage paid in the locality as hereinafter defined to the greater number of workmen, laborers or mechanics in the same trade, occupation or work of a similar nature. In the event that it be determined that there is not a greater number in the same trade, occupation, or on similar work paid at the same rate, then the average rate paid to such laborers, workmen or mechanics in the same trade, occupation or work shall be the current rate. The "locality" for the purpose of this act, shall be the county wherein the physical work is being performed: *Provided,* That where cities of the first or second class are located in said counties, each such city shall be considered a locality. Eight hours shall constitute a day's work for all laborers or other persons employed by or on behalf of the state of Kansas, or any municipality of said state, except in cases of extraordinary emergency which may arise, in time of war, or in cases where it may be necessary to work more than eight hours per calendar day for the protection of property or human life. Laborers or other persons so employed, working to exceed eight hours per calendar day, shall be paid on the basis of eight hours constituting a day's work. Not less than the current rate of per diem wages in the locality where the work is performed shall be paid to laborers or other persons so employed. And laborers and other persons employed by contractors or sub-contractors in the execution of any contract or contracts with the state of Kansas or any municipality thereof, shall be deemed to be employed by or on behalf of the state or such municipality so far as the hours of work and compensation herein provided are concerned. That the contracts hereafter made by or on behalf of the state of Kansas or by or on behalf of any county, city, township or other municipality of said state with any corporation, person or persons which may involve the employment of laborers, workmen or mechanics shall contain a stipulation that no laborer, workmen or mechanics in the employ of the contractor, sub-contractor or other person doing or contracting to do the whole or a part of the work contemplated by the contract shall be permitted or required to work more than eight (8) hours in any one calendar day except in cases of extraordinary emergency (as defined in this act); such contracts shall contain a provision that each

laborer, workman or mechanic employed by such contractor, sub-contractor or other person about or upon such public work shall be paid the wages herein provided. *Provided further*, That the provisions of this act in regard to hours worked per calendar day shall not apply to the construction, reconstruction, maintenance, or the production of local materials for: highways, roads, streets, and also the structures and drainage in connection therewith; sewer systems; waterworks systems; dams and levees; canals; drainage ditches; airport grading; drainage, surfacing, seeding and planting."

17. MATERIALS, LABOR AND EQUIPMENT:

(*a*) Unless otherwise stipulated, the Contractor shall provide and pay for all materials, labor, water, tools, equipment, light and power necessary for the execution of the work, and the haulage of all materials.

(*b*) Qualities, capacities, types and characteristics of materials and equipment are established in the specifications by naming certain manufacturers and using manufacturer's catalogue numbers. Other materials equal to those specified will be considered and shall be subject to the approval of the Architect.

(*c*) The Contractor shall furnish the Architect with the names, types and general characteristics of all materials and equipment other than those specified. He must not purchase any materials or equipment until this list has been submitted to and approved by the Architect.

(*d*) If the sub-contractors, manufacturers or material dealers wish to make substitutions or changes in the materials and equipment specified, they must submit complete and definite description of such changes in writing with illustrations to the General Contractor. If the General Contractor wishes to make the substitutions, he may submit the request for changes to the Architect. No approvals will be made directly to material dealers or sub-contractors.

18. TAX EXEMPTION:

(*a*) Materials purchased under this contract are subject to tax exemption under Kansas Retailer's Sales Tax Act. Exemption certificate forms can be obtained from the office of the Commission of Revenue and Taxation, State House, Topeka, Kansas.

VOID

19. INSPECTIONS:

(*a*) The Contractor shall permit the Architect and all persons appointed by him or the Owner to visit and inspect the work or any part thereof at all times and places during the performance of the same. He shall provide proper facilities for such inspection.

(*b*) The Architect shall be given all information and ample notification so that he may arrange for the inspection of material and shop work. If the inspector, through an oversight or otherwise, has accepted material or work which is defective, or contrary to these specifications, such material and work, no matter in what stage of completion, may be rejected by the Architect.

(*c*) Copies of all drawings and specifications must be invariably on the premises for constant reference.

20. ASSIGNMENT:

(*a*) The Contractor shall not assign this contract or any part thereof, without the approval of the Architect, nor without the consent of the surety unless the surety has waived its right to notice of assignment.

21. SUB-CONTRACTING:

(*a*) No part of this contract shall be sublet without the prior written approval of the Architect. If the Contractor shall sublet any part of this contract, the Contractor shall be as fully responsible to the Owner for the acts and omissions of his sub-contractors and of persons either directly or indirectly employed by his sub-contractors, as he is for the acts and omissions of persons directly employed by himself.

(*b*) All sub-contractors and all sub-contracts proposed for any part of the work must be approved in writing by the Architect.

22. EXTRA WORK AND CHANGES:

(*a*) Without invalidating the Contract, the Architect may order extra work or make changes by altering, adding to or deducting from the work, the contract sum being adjusted accordingly, and the consent of the surety being first obtained where necessary or desirable. No claim for extra work will be allowed unless work is ordered in writing by the Architect.

(*b*) All extra work of the kind bid upon shall be paid for at the price stipulated in the proposal. Credits for work not done shall be allowed the Owner by the Contractor in the same manner.

(*c*) If the extra work shall be of a kind for which no price was stipulated in the proposal, the actual reasonable cost of labor, including Social Security Tax and workmen's compensation insurance charges, and materials entering permanently into the work as determined by the Architect; plus not to exceed 15% to cover profit, the cost of superintendence, overhead and general expense; shall be paid.

(*d*) The Contractor shall, when requested by the Architect, furnish itemized statements of the cost of the work ordered, and give the Architect access to accounts, bills and vouchers relating thereto.

23. TIME OF COMPLETION—DELAYS:

(*a*) The work to be performed under this contract shall be completed and ready for acceptance and use on or before the time stipulated in the contract or proposal. The Contractor guarantees to deliver the work to the Owner completed on this day.

(*b*) If the Contractor be delayed in the completion of the work by any act or neglect of the Owner or Architect, or any employee of either, or by any other contractor employed by the Owner, or by changes ordered in the work, or by strikes, lockouts, fire, unusual delay by common carriers, unavoidable casualties or any causes beyond the Contractor's control, or by delay authorized by the Architect pending arbitration, or by any cause which the Architect shall decide to justify the delay, then the time of completion shall be extended for such reasonable time as the Architect may decide.

(*c*) No such extension shall be made for a delay occurring more than seven days prior to date claim is made in writing to the Architect. In the case of a continuing cause of delay, only one claim is necessary.

24. IMPERFECT WORK:

(*a*) Imperfect work, such as settlement, shrinkage, etc., of any description resulting from the use of materials of poorer grade than provided for in the specifications, or from a deviation from the construction as set forth by the drawings, without authority, and occurring within one year after the work is completed, shall be made good by the Contractor at his own cost.

(*b*) All materials and labor of whatever kind employed in the work is subject to the approval and acceptance of the Architect.

(c) All materials not fulfilling the requirements of the specifications, and rejected by the Architect, shall be immediately removed from the premises by the Contractor, who shall at once, and at his own cost, substitute good and proper materials.

25. DEDUCTIONS FOR UNCORRECTED WORK:

(a) If the Architect deems it inexpedient to correct work injured or not done in accordance with the contract, the difference in value, together with a fair allowance for damage, shall be deducted, if acceptable to the Owner.

26. TERMINATION FOR BREACH OF CONTRACT:

(a) Should the Contractor at any time refuse, neglect or fail to prosecute the work with promptness and diligence, or default in the performance of any of the provisions of the contract, the Owner may serve written notice upon the Contractor and the Surety of his intention to terminate the contract.

(b) Notices shall contain the reasons for the intended termination of the contract. If violations of contract or delays in the prosecution of the work are not corrected and satisfactory arrangements made, after ten (10) days of serving notice upon Contractor, the contract shall cease and terminate.

(c) In the event the contract is terminated the Owner will immediately serve notice thereof upon the Surety and the Contractor. The Surety shall have the right to take over and perform the contract; provided, however, that if the Surety does not commence performance thereof within 30 days from the date of the mailing to such Surety of notice of termination, the Owner may take over the work and prosecute the same to completion by contract for the account and at the expense of the Contractor, and the Contractor and his Surety shall be liable to the Owner for any excess cost occasioned the Owner thereby. In such event the Owner may take possession of and utilize in completing the work, such materials, appliances and plant as may be on the site of the work and necessary therefor.

27. NOTICE:

(a) Any notice to any contractor from the Architect relative to any part of this contract shall be in writing and considered delivered and the service thereof completed when said notice is posted, by registered mail, to the said Contractor at his last given address, or delivered in person to said Contractor or his authorized representative on the work.

28. OWNER'S RIGHT TO WITHHOLD CERTAIN AMOUNTS AND MAKE APPLICATION THEREOF:

(a) The Contractor agrees that he will indemnify and save the owner harmless from all claims growing out of the lawful demands of sub-contractor, laborers, workmen, mechanics, material men, and furnishers of machinery and parts thereof, equipment, power tools, and all supplies, including commissary incurred in the furtherance of the performance of this contract.

(b) The Contractor shall furnish satisfactory evidence that all obligations of the nature hereinabove designated have been paid, discharged, or waived. If the Contractor fails to do so, then the Owner may either withhold from the Contractor's unpaid compensation a sum of money deemed reasonably sufficient to pay any and all such lawful claims until satisfactory evidence is furnished that all liabilities have been fully discharged, whereupon payments to the Contractor shall be resumed in accordance with the terms of this contract, but in no event shall the provision of this sentence be construed to impose any obligation upon the Owner to either the Contractor or his Surety.

(c) In paying any unpaid bills of the Contractor, the Owner shall be deemed the Agent of the Contractor, and any payment so made by the Owner shall be considered as a payment made under the contract by the Owner, to the Contractor, and the Owner shall not be liable to Contractor for payment made in good faith.

29. PAYMENTS:

(a) The Contractor shall be paid 90% of the value of materials and labor delivered on the building site or used in the building, less any amount previously paid. On or about the 25th day of the month, estimates shall be presented to the Business Office of the Institution where work is being performed, so that a voucher can be prepared and presented for payment by the 15th day of the month following that for which payment is requested. Final payment will be made as quickly as possible after the work is completed and accepted.

30. CLEANING UP:

(a) The various contractors or sub-contractors for all parts of the work shall clean up and remove all trash which has accumulated from and during the execution of their part of the work and leave the premises ready for the next workman, or for acceptance.

31. LIQUIDATED DAMAGES:

(a) To cover the cost of all extra inspection, salaries of contingent force and other expenses entailed upon the Owner by any delay in completion of the contract, the Owner shall be entitled to liquidated damages for each and every day's delay beyond the time set for completion, and such minor sums shall be deducted from any moneys which may be due or become due to the Contractor on account of this contract.

(b) Liquidated damages shall vary with the contract price as follows:

Contract Price	Damages
$100,000.00 and less	$20.00 per day
$100,000.00 to $500,000.00	$50.00 per day
$500,000.00 to $1,000,000.00	$100.00 per day
$1,000,000.00 to $3,000,000.00	$300.00 per day
$3,000,000.00 and over	$500.00 per day

SPECIAL CONDITIONS OF THE CONTRACT AND ALTERNATES

Science Building

Fort Hays Kansas State College Hays, Kansas

2-1. Scope of Project:

(a) Construct a complete Science Building and Alterations and Additions to the existing Science Building, on the grounds of the Fort Hays Kansas State College, Hays, Kansas, in Accordance with Drawings and Specifications issued by the Office of State Architect.

2-2. Layout of Work:

(a) The General Construction Contractor shall employ an experienced and competent civil engineer to establish all lines and grades for the work to be done under his contract. He shall keep on the job at all times a complete level and transit, in good working conditions, and allow the Architect use of same. Other contractors shall establish their grades and lines, coordinated with those of the General Construction Contractor.

2-3. Construction Schedule:

(a) As soon as practicable the General Construction Contractor shall prepare and deliver to the Architect a construction progress schedule showing the proposed dates of commencement and completion of each of the various subdivisions of work embraced by the contract.

2-4. Cost Schedule:

(a) Each Contractor shall prepare and submit to the Architect a schedule of the principal items of construction under his contract with the estimated cost of each item. The item of construction listed on schedule shall be as directed by the Architect. The cost of each item of work shall be taken from the Contractor's estimate sheets and must confirm to his lump sum bid.

(b) Periodical estimates of work complete shall be correlated with the cost schedule and furnished to the Architect with requests for partial payments.

2-5. Field Offices:

(a) The General Construction Contractor shall erect where directed on the premises, maintain in good condition and remove when directed, a temporary weather-tight field office building for the use of the General Construction Contractor and the Architect's Representative. The office shall be provided with heat, electric light, telephone and janitor service.

(b) The building shall be painted two coats on the outside and stained on the inside. It shall have a room of approximately 120 sq. ft. of floor space for Architect's Representative, provided with doors with locks, one desk and two chairs, a 3 by 8 foot plywood table attached to wall and racks for drawings.

2-6. Temporary Toilets:

(a) The General Contractor shall provide for the use of all his workmen, and those of any sub-contractor, where directed, ample temporary sanitary toilet accommodations and keep such clean and free from flies. Where possible, connections shall be made to existing sewer. Prior to the completion of the contract, all connections and appliances connected therewith, are to be removed and the premises left perfectly clean.

2-7. Barricades:

(a) Furnish and maintain all necessary guard rails, barricades, canvasses, etc., as needed to protect the passersby and building.

2-8. Storage of Materials:

(a) All materials delivered to the project shall be stored in such a manner as to keep them in a first class condition and free from deterioration. Cement, lime, plaster, etc., shall be stored in the storage sheds mentioned above. Stone, brick, tile and block shall be carefully stacked and shall be kept clean. Lightweight concrete block shall be covered and kept dry. All aggregates shall be piled so as to prevent mixing with earth and other foreign substances. Reinforcing steel shall be stored on racks at least 6 inches from the ground, and shall be protected from the weather.

2-9. Water:

(a) The General Construction Contractor shall make arrangements with the Local Water Department or College for the use of water during the construction period. He shall provide and pay for all preliminary piping, connections, meters, etc., required to make water available at the work and shall pay for all water used, making payment to the Local Water Department or College at the agreed rate.

2-10: Electrical Energy:

(a) The General Construction Contractor shall make all necessary applications, pay all fees and charges in connection with providing and maintaining temporary Electrical energy for power and light required during the course of construction.

(b) Other contractors shall make arrangements with the General Construction Contractor or the Local Service Company for Electrical energy and furnish additional temporary wiring required. Rates charged for Electrical energy shall not be in excess to that charged by the Local Service Company.

(c) All temporary services and wiring shall be removed at the completion of the project.

2-11. Temporary Heat:

(a) The General Contractor shall see that temporary local heating is provided to prevent injury from dampness or cold; and at all times when concrete is not thoroughly set before temporary enclosures is complete. After the first coat of plaster has been applied, he shall maintain a temperature of at least 50°F.

(b) The General Contractor shall furnish all temporary heat until the heating system in the building can be placed in operation. It will be the responsibility of the Plumbing and Heating Contractor to place the building heating systems in operation as soon as possible and maintain the operation of the heating system until the building is completed. Steam will be furnished to the contractor at no cost as soon as tunnel and steam lines are completed.

2-12. Cutting, Patching and Digging:

(a) The General Contractor shall do all cutting, fitting, or patching of his work which may be required to make its several parts come together properly, and fit it to receive, or to be received by the work of other contractors shown upon or reasonable implied by the drawings and specifications for the completed structure and he shall make good after them as the Architect may direct.

2-13. Closing-In Work:

(a) The General Contractor shall notify his sub-contractors, and any and all sub-contractors or contractors under the Owner, when he is ready for them to install their portion of the work. Should any sub-contractors fail to install their work within a reasonable length of time, the General Contractor shall notify the Architect in writing and shall receive written instructions as to proceeding with the work. No piping, wiring, ducts, equipment, etc., shall be enclosed or covered until the proper tests and inspections have been made by the Architect.

2-14. Contract Termination in the Event of War:

(a) If the work under this contract should be stopped under authorization of a public authority for a period of three (3) months, through no account or fault of the Contractor or any one employed by him, due to the lack of proper allocations, priorities or other materials under government controls, the Contractor may, upon seven (7) days written notice to the Owner and the State Architect, stop work or terminate the contract. Payment to the Contractor will be on the basis of material and labor incorporated in the project together with such overhead, costs and legitimate profits as would cover the extent of the work performed.

2-15. Progress Photographs:

(a) Progress photographs, 6 by 8 inches in size shall be made of the project by the General Construction Contractor.

(b) The photographs shall be taken when the work begins and each month thereafter as long as work is in progress on the outside of the building. Two exposures shall be made at each time and two sets of glossy prints shall be furnished to the Architect.

2-16: Drawings.

(a) Accompanying these specifications are the following drawings which are to become a part of these specifications, and are intended to coordinate the work of the contracts. Any work included in one and not the other shall be fully executed as though included in both. Each bidder shall check the specifications and drawings and advise the Architect if any sheets are missing:

Architectural

1. Plot Plan - Index - Cover Sheet
2. Elevations and Miscellaneous Exterior Details
3. First Floor Plan, Room and Door Schedules
4. Second Floor Plan, Room and Door Schedules, Door Frames
5. Third Floor Plan, Room and Door Schedules
6. Typical Cross Sections and Exterior Wall Sections
7. Typical Cross Sections, Exterior Wall Sections and Roof Plan
8. Window Details and Schedule
9. Details of Rooms A 101, A 201, A 301 and Stairs #1
10. Details of Rooms A 110, A 208, A 307, Stairs #3 and Lecture Room Seating Plans
11. Interior Details of Toilet Rooms and Alterations in Existing Building and Chalk Board, Tack Board Schedules
12. Interior Details of Corridors, Miscellaneous Interior details
13. Interior Details of Rooms A 103 thru A 108 and Typical details of Similar Rooms
14. Details of Lecture Rooms A 125 and A 313 and Miscellaneous Interior Details

Structural

S-1. Foundation Plan
S-2. First and Second Floor Framing Plan
S-3. Third Floor Framing Plan
S-4. Roof Framing Plan

Plumbing

P-1. Foundation. Plumbing Plan
P-2. First Floor Plumbing Plan
P-3. Second Floor Plumbing Plan
P-4. Third Floor Plumbing Plan

Mechanical

M-1. Mechanical Foundation Plan
M-2. Mechanical First Floor Plan
M-3. Mechanical Second Floor Plan
M-4. Mechanical Third Floor Plan

Electrical

E-1. Electrical Foundation Plan
E-2. Electrical First Floor Plan
E-3. Electrical Second Floor Plan
E-4. Electrical Third Floor Plan

2-17. Alternates:

(a) Work contemplated under the different alternates shall include all labor, material, equipment and services necessary for and incidental to the completion of all work under each alternate.

(b) Each bidder shall furnish separate bids for each alternate applicable to his proposal, stating the amount to be added to or deducted from the bid in case the alternate is accepted. He shall require all sub-contractors to furnish separate bids for each alternate.

(c) Each sub-contractor shall examine each separate alternate and fully inform himself exactly how each alternate affects his part of that work. He shall submit to the Contractor a separate bid for each alternate that contains any addition to or deduction from the base bid.

General Contract

Alternate #1 (Open Shelving): (Deduct)

(a) The General Contractor shall state on his proposal sheet the amount to deduct from the base proposal if all open shelving shown on the drawings is omitted.

Alternate #2 (Paint Substitute for Desco Coatings): (Deduct)

(a) The General Contractor shall state on his proposal sheet the amount to deduct from the base proposal if all of Section 27 - Spray-On Coatings is omitted and 3 coats of paint substituted in lieu thereof, painting to be as specified under Section 24-9.

Alternate #3 (Paint Material Substitute): (Deduct)

(a) The General Contractor shall state on his proposal sheet the amount to deduct from the base proposal if all paint specified under Section 24-9 is omitted and changed to read as follows:

All walls and ceilings in room scheduled for painting, including columns and beams, shall be painted with two coats of latex base paint similar and equal to Glidden Company's "Spred-Satin".

Alternate #4 (Stack Bond Blockwork): (Deduct)

(a) The General Contractor shall state on his proposal sheet the amount of money to deduct from the base proposal if stack bond concrete block work of interior walls and partitions is changed to a running bond system.

Alternate #5 (Omit Concrete Floor Over Bar Joists): (Deduct)

(a) The General Contractor shall state on his proposal sheet the amount of money to deduct from the base proposal if the 2½" concrete slab and corruform, on bar joist construction, is omitted from the areas indicated above third floor rooms of existing building. (Bar joists to be left as shown and specified.)

Alternate #6 (Kitchenette Unit): (Deduct)

(a) The General Contractor shall state on the Proposal Sheet the amount to deduct from the Base Proposal if the Kitchenette unit as specified in Paragraph 25-15 is omitted from the contract.

Alternate #7 (Aluminum Door): (Add or Deduct)

(a) The General Contractor shall state on the Proposal Sheet the amount to add or deduct from the Base Proposal if aluminum doors and frames as specified for Door Opening #1 are furnished in opening No. 3, No. 35 and No. 50 in lieu of wood door and steel frames as specified.

(b) Each aluminum entrance shall be equipped and installed with the following hardware:

(1) 2 - 2'-10" x 7'-0" x 1 3/4" "Trimline" Model E doors

(2) Standard frame 1 3/4" x 4"

(3) Pull handles #25020

(4) Push Bars #25029

(5) Standard nylon bearing butt hinges

(6) Norton "D" surface mounted closers

Alternate #8 (Quarry Tile): (Add)

(a) The Contractor shall state on the Proposal Sheet the amount to add to the Base Proposal if Stairs #1, #2, #3 and #4 are furnished with full quarry tile treads and risers in lieu of quarry tile nosing as specified in the Base Bid.

(b) Under this Alternate, rail curbs and wall string will remain exposed concrete with honed rubbed finish.

Alternate #9 (Vinyl Asbestos Tile): (Add)

(a) The General Contractor shall state on the Proposal Sheet the amount to add to the Base Proposal if Rooms #A116, A124, A125 including concrete bleachers

and the wood bleacher in Room #A313 are covered with vinyl asbestos floor covering as specified in the Base Bid for other areas.

Electrical Contract

Alternate No. E-1 (Deduct):

(a) This Alternate will be accepted if Alternate M-1 is accepted, which deletes the air conditioning in all areas except Lecture Rooms and Offices A211 and A212.

(b) Delete the oil-filled cutout transformers and all equipment for the 4160 volt to 480 volt transformation. Furnish a power feeder to a 20 HP chiller 208/60/3; furnish magnetic starters and disconnects for a 1½ HP condenser water pump 208/60/3 and a 1½ HP cooling tower fan 208/60/3. Provide all control wiring as indicated for the base bid.

(c) Transformers for service to Panel M shall be three (3) 50 KVA for 120/208 volt secondaries. Feeder to panel M shall be four 500 MCM-RHW. Panel M shall have an additional 100 A, 3 HP for chiller; 15A, 3P for pump and a 15 amp., 3 P for C.T. fan.

(d) Install a furnished thermostat; furnish and install an on-off switch with stenciled plate and provide all wiring for the electrical installation of the 2 HP A.C. unit 208/60/1 for rooms A211 and A212.

Alternate No. E-2 (Add):

(a) This Alternate will be accepted if Alternate M-2 is accepted which adds air conditioning equipment for Rooms 106 and 107 in the existing building.

(b) Install a furnished thermostat; furnish and install on-off fan switch, an on-off compressor switch; provide all wiring for the electrical installation of the 3 HP A.C. unit 208/60/1.

Alternate No. E-3 (Add):

(a) This Alternate will be accepted if Alternate M-3 is accepted which provides heating and air conditioning for Room E101 and Room E113 in the existing building.

(b) Provide a power circuit for the unit ventilators from Panel D.

Alternate No. E-4 (Deduct):

(a) State the amount to deduct from base bid for omitting wiring to Kitchenette in Room 107C.

Alternate No. E-5 (Add):

(a) Furnish 4160 volt service conductors from utilities pole to the oil filled cutouts. Furnish a 5 KV pot head and extend 5 KV conductors in conduit from pole, under street as indicated. This Contractor shall provide all cutting and patching of street. Repair materials shall match existing paving. At the

contractors option, the service conduit may be driven (or pushed) beneath paving.

(b) Refer to the plans for size and location of service conductors.

Mechanical Contract

Alternate No. M-1:

This alternate provides for omitting the air conditioning (cooling) for all rooms except A125, A314, A211 and A212. The water chiller unit, cooling tower, condenser water pump and condenser water piping shall be reduced in size as hereinafter specified. An auxiliary air conditioning system shall be provided for cooling Offices A211 and A212.

Omit the water chiller unit specified in the base bid and substitute a Trane model CG20B, or approved equal, water chiller unit. Unit shall be as specified in the base bid except motor shall be 20 H.P. 208/60/3 with across-the-line type magnetic motor starter. Unit shall have a capacity to cool 40 GPM water entering at 57 deg. F. and leaving at 45 deg. F. when furnished with 65 GPM condenser water at 85 deg. F. based on 105 deg. F. condensing temperature.

Omit the two summer-winter pneumatic 3-way valves for zone No. 2 and provide plugged ties for the future installation of these valves. Omit chilled water piping between the omitted 3-way valve and water chiller unit and reduce chilled water piping to chiller unit to $2\frac{1}{2}$" instead of 4".

Furnish Marley Model 5720 "Permatower", or approved equal, induced draft cooling tower in lieu of tower specified in the base bid. Tower shall have a capacity to cool 70 GPM from 95 deg. F. to 85 deg. F. at 78 deg. F. wet bulb. Motor shall be 1.2 H.P. 208/60/3. Motor starter and electrical wiring will be provided by the Electrical Contractor.

Furnish a Bell and Gossett size $1\frac{1}{4}$ series 1531 centrifugal condenser water pump in lieu of condenser water pump specified in the base bid. Pump shall be $1\frac{1}{2}$ H.P. 208/60/3 1750 RPM and shall have a capacity of 65 GPM at 50 ft. head. Motor starter and electrical wiring will be provided by the Electrical Contractor.

Condenser water piping shall be $2\frac{1}{2}$" instead of 5" as specified in the base bid.

Furnish and install a Bryant model 24-556 self-contained air cooled air conditioning unit for Offices A211 and A212. The unit shall be mounted on the wall outside the building as detailed on the drawings. Unit shall be 2 H.P. 208/60/1 and shall be furnished with remote cooling thermostat and filter rack pit. Provide angle iron bracket for mounting as detailed on the drawings. Unit shall have a capacity of 25,000 BTU/hr at ASRE standard rating. Furnish and install ductwork, duct lining and grilles and registers as shown. Room air conditioner fan coil units shall remain. Electrical wiring will be provided by the Electrical Contractor.

Alternate No. M-2:

The purpose of this alternate is to provide air conditioning (cooling and ventilating) for Rooms 106A, 106B, 106C, 107A and 107B in the existing portion

of the building. The exhaust fan for Toilet 107C is included in the base bid.

Furnish and install a Bryant Model 30 VBS, or approved equal, air conditioning unit suspended from the ceiling where indicated as detailed on the drawings. The unit shall deliver 1000 CFM @ .25" ext. S.P. 1/3 H.P., 115/60/1 and shall have a rated cooling capacity of 30,000 Btu/hr @ standard ASRE rating. Furnish complete with blower and motor, direct expansion cooling coil with expansion valve, insulated casing with baked enamel finish, filter rack and filter, fan relay, thermostat with integral blower switch and suspension mounting brackets.

Furnish and install on a concrete pad outside the building where indicated on the drawings a Bryant model 30-562, or approved equal, air cooled condensing unit. Unit shall be 3 HP, 208/60/1 and shall have a capacity of 30,000 Btu/hr at standard ASRE rating.

Furnish and install ductwork, duct lining, and grilles and registers as shown on the Plans and as specified in the base bid. Furnish and install a weather louver and screen for fresh air where indicated on the drawings.

Furnish and install type K hard drawn copper refrigerant piping with wrought copper sweat type fittings where indicated on the Plans. Joints shall be made with silphos rod or other approved brazing rod. Refrigerant suction piping shall be insula ted with 1½" thick fiberglass molded sectional pipe insulation as specified in the base bid for chilled water piping. Provide 3/4" copper condensate drain piping to ground outside building.

Concrete pad for air cooled condensing unit will be provided by the General Contractor. Electrical wiring will be provided by the Electrical Contractor. Wiring diagrams shall be provided by the Heating and Air Conditioning Contractor. The piping system shall be evacuated in a manner as prescribed by the condensing unit manufacturer and the system given a full operating charge of freon and oil. The system shall be put into operation and checked by the Heating and Air Conditioning Contractor, who shall guarantee the system for one year as specified in the base bid.

Alternate No. M-3:

The purpose of this alternate is to provide heating and air conditioning for Room E101 and Room E113 in the existing building.

Furnish and install a unit ventilator of size and capacity as scheduled on the drawings. Unit ventilator shall be heating and cooling type as specified in the base bid. Provide chilled water and drain piping as indicated on the drawings. Control of this unit shall be as specified for unit ventilator control in the base bid. Provide ductwork for outside air to unit and weather louver as indicated. Insulate outside air duct as specified in the base bid.

All cutting and patching required will be by the Heating and Air Conditioning Contractor. Electrical wiring will be provided by the Electrical Contractor.

Alternate No. M-4 (Deduct):

(a) Plumbing Contractor shall state on his proposal the amount to deduct for omitting the Lavatory and Water-Closet located in Room 107C, located in existing building, and all water, vent and drainage piping indicated by the drawings serving the above fixtures and the Kitchenette Unit in Room 107D.

Alternate No. M-5 (Deduct):

(a) State the amount to deduct from the base bid, if in lieu of type K copper hot and cold water piping, all water piping (hot, cold and recirculating) nipples and couplings shall be schedule 40 galvanized steel pipe and shall meet all requirements of ASTM A120-47 specifications.

3 - SITE PREPARATION, REMOVALS AND DEMOLITION WORK

3-1. Scope:

(a) Furnish all labor, material, equipment and appliances, and perform all operations in connection with the provisions of site preparation, removals and demolition work in strict accordance with the specifications and drawings, and subject to the terms and conditions of the contract.

3-2. Clearing Site:

(a) Remove all loose earth & rock, debris, brush, walks, etc., as required to prepare site as directed by the Architect.

3-3. Protections:

(a) The contractor shall protect all existing work, including adjacent buildings, underground piping, walks and streets liable to damage under this contract. Such protection shall be of suitable materials and form. All necessary repairs shall be made at the expense of the contractor. He shall provide any and all necessary temporary connections to utility lines servicing existing buildings.

(b) Trees and shrubs within the radius of the building operations, except where they are required to be removed shall be adequately protected from damage.

3-4. Temporary Drainage:

(a) Construct and maintain all necessary temporary drainage and do all pumping necessary to keep the excavation and basement free from water.

(b) Excavations, trenches and buildings shall be protected at all times from damage by water. The contractor shall provide all pumps, equipment and enclosures necessary to provide this protection.

3-5. Guard Rails, Etc.

(a) Furnish and maintain necessary guard rails and barricades which shall be properly lighted at night.

3-6. Damage:

(a) Any property damaged through lack of proper precautions or by failure to provide adequate protection shall be repaired or replaced with new work at the expense of the contractor causing the damage.

3-7. Removals and Demolition Work:

(a) The contractor shall tear down all work indicated by the drawings to be removed from the existing building, existing walks, existing curbs, etc. and shall provide all necessary protection against damage to work which is not intended to be removed.

(b) The contractor shall remove all rubbish, etc., caused by the demolition under (a) from the site and laid to points designated by the Architect.

(c) The contractor shall salvage all stone facing that is removed from the existing building and he is to reuse stone units that are free of defects for making patches in the existing walls as required by the drawings. He is to deliver, to the owner, all surplus stone units as directed by the Architect.

(d) The contractor shall salvage all windows and doors, including jambs and trim. He may rework and reuse these items which are sound and free of defects as indicated by the drawings. Other units to be delivered to the Owner when required by the Architect.

3-8. Crushed Stone Base for Concrete Paving:

(a) Pavement shall have a 6" crushed stone base as shown on plans to be laid and rolled in two layers.

(b) Crushed stone base shall be predominately limestone consisting of ninety (90) percent or more of material produced by the mechanical crushing of limestone.

(c) The grading and plasticity shall be as follows:

Retained on 2 inch sieve	0%
Retained on 1 1/2 inch sieve	0 to 5%
Retained on 3/4 inch sieve	5 to 30%
Retained on #4 sieve	35 to 60%
Retained on #10 sieve	45 to 70%
Retained on #40 sieve	60 to 84%
Retained on #200 sieve	80 to 92%
Plasticity index (AASHO)	1 - 6
Liquid limit, not more than (AASHO)	25

(d) The fraction passing the No. 200 sieve shall not be greater than 3/4 of the fraction passing the No. 40 sieve.

(e) Crushed stone shall be placed on prepared subgrade and rolled until it is thoroughly compacted and locked to specified thickness. The final surface shall be well locked, uniformly smooth and true to grade without high and low areas or other irregularities.

4 - EXCAVATION AND GRADING

4-1. Scope of Work:

(a) Furnish all labor, materials, equipment, and appliances, and perform all operations in connection with the excavation and grading in strict accordance with the specifications and drawings and subject to the terms and conditions of the contract.

4-2. Sub-Surface Soil Data:

(a) No sub-surface soil investigations have been made.

Bidders are expected to examine the site and then decide for themselves the character of materials to be encountered.

4-3. General:

(a) The entire area of the building shall be excavated down to the depths required by drawings.

(b) Backfill below first floor slab areas with river run gravel approved by Architect.

(c) All surplus earth shall be disposed of on the campus as directed.

4-4. Excavation:

(a) Excavate to elevations and dimensions shown on drawings, plus additional space to erect forms, shoring, masonry and inspection of foundations. Provide space for waterproofing where specified.

(b) Excavation for footings shall be cut to sizes required and formed. Bank forms for concrete walls will not be permitted.

(c) Protect bottom of excavation from frost. Do not place foundations, footings or slabs on frozen ground. Shore and brace excavations, protect all slopes and earth banks and provide sheet piling when necessary to prevent cave-in. Remove shoring before backfilling is completed, but not until permanent supports are in place.

(d) Footings and foundations shall not be placed on earth fill. Fill excess cut under footings and foundations with concrete.

4-5. Responsibility for Excavation:

(a) The General Construction Contractor shall perform all excavation required for work under his contract. He shall cooperate with other contractors by holding excavated areas open sufficient time for the installation of their work.

(b) Other contractors shall perform all additional excavation required for the installation of their work.

4-6. Backfill:

(a) At the proper time, backfill around all piers, walls, areaways and elsewhere required to bring the earth to proper levels and grades for subsequent work. Use only earth without rubbish. Backfill with care to prevent damage to membrane waterproofing.

(b) Deposit fill and backfill in layers not to exceed 8 inches under slabs, pavements and other surfacing and 12 inches under other areas; compact each layer. Compact fill under slabs with pneumatic tempers after a light sprinkling with water.

4-7. Interior Grading:

(a) Spaces within the building shall be carefully graded to the levels required to receive concrete slabs after backfilling with gravel as specified under Paragraph 4-3 (b).

4-8. Exterior Grading:

(a) Do all rough grading, including cut and fill, Necessary to bring areas shown on plot plan to the following levels; for paving, walks and other surfaced areas, to underside of respective surfaces; for lawns and planted areas, to 4 inches below finished grades as shown on building elvations and by contour lines on plot plan.

(b) Grades not otherwise indicated shall be uniform levels or slopes between points where elevations are given or between such points and existing finished grades. Abrupt change in slopes shall be rounded.

(c) Strip top soil from all areas to be excavated and stock pile for use in fine grading.

4-9. Top Soil:

(a) After rough grading has been completed and approved, the sub-grade shall be scarified to a depth of 3 inches and a 4" inch layer of top-soil uniformly spread over all areas shown on plot plan to be graded. Top-soil previously stripped and stock piled may be used, however, the contractor shall furnish all additional top-soil that may be required to provide the thickness specified. New top-soil shall be fertile, natural soil, typical of the locality, free from stones, clay and weeds. Prepare top-soil to receive sod or seed by others, by removing stones and grading to eliminate water pockets and irregularities.

4-10. Unit Prices:

(a) The contractor shall state in the space provided in the proposal, unit prices to govern for all additions to or deductions from excavation work as follows:

(1) General Excavation: For one cu. yd., of general excavation including necessary shoring, bracing, pumping, backfilling, and disposal of surplus excavated material exclusive of that for footings, trenches and pits.

(2) Neat Excavation: For one cu. yd., of neat excavation for footings, trenches, pits, etc., including all necessary shoring, bracing, pumping, backfilling and disposal of surplus excavated material.

5 - CONCRETE WORK

5-1. Scope:

(a) Furnish all labor, materials, equipment and appliances and perform all operations in connection with the installation of concrete work complete, in strict accordance with the specifications and the drawings, and subject to the terms and conditions of the contract.

5-2. General:

(a) All work must be done under the supervision of a qualified supt., experienced in concrete construction.

(b) Co-operate with other trades for the proper positioning and setting of all built-up and imbedded items.

(c) Architectural Concrete is that concrete which becomes and remains a finished material surface, either exterior and interior. Where a portion of the concrete unit is exposed to view as a finished material, the balance of the unit or pour shall have the same material requirement.

(d) Structural Concrete is the concrete in footings, foundations, etc., covered or faced by other materials upon completion of work.

5-3. Portland Cement:

(a) Portland cement shall conform to the Standard Specifications for Portland Cement, ASTM Designation: C-150-55 Types I and III, and the Standard Specifications for Air-Entraining Portland Cement, ASTM Designation: C 175-55, Types IA and IIIA. High early strength Portland cement may be used only upon approval of the Architect.

(b) Portland cement for use in Architectural Concrete shall be of approved brands having uniform color and secured in a quantity sufficient for all Architectural Concrete for this job.

5-4. Coarse Aggregate:

(a) Furnish hard, durable, uncoated crushed stone conforming to Tentative Specifications for Concrete Aggregates ASTM Designation: C33-55T, and the following gradation in percentages by weight determined by laboratory square mesh sieves:

Passing 2" sieve	100%
Passing 1½" sieve	95% to 100%
Passing 3/4" sieve	35% to 70%
Passing 3/8" sieve	10% to 30%
Passing #4 sieve	0% to 5%

(b) After acceptance of a grading, a variation in the amount passing any sieve size of more than 10 percent of the total will not be permitted.

(c) The maximum sized aggregate shall be not larger than one-fifth (1/5) of the narrowest dimension between sides of the member for which the concrete is to be used nor larger than three-fourths (3/4) of the minimum clear spacing between reinforcing bars, or of the clear distance between reinforcing bars and forms as shown on the drawings.

5-5. Fine Aggregate:

(a) Fine aggregate shall be sand having clean, hard, durable, uncoated grains free from silt, loam and clay, conforming to tentative specifications for Concrete Aggregates ASTM Designation: C33-55T, and C88-55T sized from fine to coarse within the following percentages by weight:

	Arch. Concrete	Struct. Concrete
Passing No. 4 sieve. . . .	95-100 per cent	95-100 per cent
Passing No. 16 sieve . . .	45- 70 per cent	45- 70 per cent
Passing No. 50 sieve . . .	15- 30 per cent	10- 15 per cent
Passing No. 100 sieve. . .	2- 8 per cent	1% minimum

(b) Not more than 35 per cent shall pass a standard size sieve and be retained on the next smaller size.

5-6. Water:

(a) Water used in concrete shall be clean and free from deleterious amounts of acids, alkalis, or organic materials. In general water which can be safely used for drinking purposes will be satisfactory for concrete. One gallon of water will be considered as weighing 8.33 pounds.

5-7. Admixtures:

(a) Air Entraining Agents used to produce the specified amount of entrained air shall be Vinsol Resin, Darex AEA, Protex AEA, or an approved equal conforming to the applicable requirements of Standard Specification ASTM Designation: C260-54.

(b) Calcium Chloride as an accelerator will be permitted only when specifically approved by the Architect. When "flake-type" calcium chloride is used the amount shall not exceed 2% (by weight) of the cement and if "pellet-type" calcium chloride is used, the amount shall not exceed 1-3/4% (by weight) of the cement. Calcium chloride used in the work shall meet the requirements of the "Standard Specification for Calcium Chloride ASTM Designation: D98-48.

5-8. Expansion Joint Filler:

(a) Provide premoulded expansion joint filler similar to Celotex Co., "Flexcell" and composed of fiberboard impregnated with asphalt. Joint material shall be for full thickness of slab or joint and unless otherwise indicated ½ inch thick.

5-9. Metal Reinforcements:

(a) Metal reinforcement shall conform to the requirements of the Tentative Specifications for Billet-Steel Bars for Concrete Reinforcement of Intermediate Grade, ASTM Designation A15-54T. Deformation shall conform to Tentative Specifications for Minimum Requirements for the Deformation of Deformed Steel Bars of Concrete Reinforcement, ASTM Designation: A305-53T. There shall be certified mill tests for twenty-five (25) tons and over of reinforcing steel.

(b) When delivered to the site, all metal reinforcement shall be properly bundled and clearly marked with at least one metal and or linen tag to each bundle. Furnish reinforcement for precast concrete and other concrete work in addition to that shown on Structural drawings.

(c) Wire for concrete reinforcement shall conform to the requirements of the Standard Specifications for Cold-Drawn Steel Wire for Concrete Reinforcement ASTM Designation: A82-34.

5-10. Metal Accessories:

(a) Provide all spacers, chairs, ties and other devices necessary for properly placing, spacing, supporting and fastening reinforcement in place.

5-11. Bending Diagrams:

(a) Bending diagrams shall be prepared by a competent structural engineer selected by the Architect for this work. Payment for this service shall be at standard rates and paid to the engineer by the contractor furnishing the reinforcing steel.

5-12. Storage of Materials:

(a) Cement in packages shall be stored in a weathertight, dry, well ventilated building with the floor raised a minimum of one (1) foot from the ground. Each shipment shall be identified and arranged for easy access and inspection and used in sequence of receipt. If packaged cement is not used with a reasonable time as determined by the Architect, the packages shall be handled, turned, and re-stacked to prevent sack setting. Cement which has hardened in packages shall not be used. Cement which has been spilled, reclaimed from cleaning sacks, or salvaged in any other manner shall be discarded. Cement contained in broken or leaking packages but which is otherwise in good condition may be used only for incidental construction where design strength is not a factor and then only when specifically approved by the Architect. Bulk cement shall be used direct from cars to bins.

(b) Aggregates obtained from different sources and those having different gradations shall be stored separately and batched by weight. Mixing in the stock pile or alternating layers in the stock pile will not be permitted. Stock piles shall be placed on boards or other sites properly prepared to prevent inclusion of foreign material. Stock piles shall be constructed in horizontal layers or lifts to prevent segregation of sizes, shall be free-draining and during severe weather, shall be protected from freezing and inclusion of frost. Fine aggregates shall be stock piled a minimum of twenty-four (24) hours before being used to make concrete.

5-13. Form Design:

(a) Form joints shall be leak-proof and arranged vertically or horizontally to conform to the pattern of the design as shown on the drawings. Rustication strips shall be accurately made and located, and shall be fastened to the structural form by double-headed or casing nails in such manner that the forms can be removed without disturbing the rustication strip.

(b) Forms placed on successive units for continuous surfaces shall be fitted to accurate alignment to assure a smooth completed surface free from irregularities. In long spans where intermediate supports are not possible, the anticipated deflection in the forms due to the weight of fresh concrete shall be taken into account in the design of the forms so that finished concrete members will have true surfaces conforming accurately to desired lines, planes and elevations.

(c) If adequate foundations for shores cannot be secured, trussed supports of adequate design shall be provided.

(d) The width and thickness of the lumber and the size and spacing of wales shall be determined with due regard to the nature of the work and shall be sufficient to insure rigidity of the forms and prevent distortion due to the pressure of the concrete. Forms for beams, girders, and lintels shall be constructed so that the sides may be removed without disturbing the bottom of the form or its support.

(e) Access openings at or near the bottom of wall and column forms shall be provided to permit inspection and cleaning prior to concrete placement. All forms shall be readily removable without hammering or prying against the concrete.

5-14. Form Construction:

(a) Forms, complete with centering, moulds, rustication strips shall be constructed to the shape, form, line and grade shown on the drawings and shall be maintained sufficiently rigid to prevent excessive deformation under load.

(b) The contact surface of all unlined forms shall be constructed of 5/8 inch or 3/4 inch 5-ply Douglas fir structural plywood of concrete form grade according to Bureau of Standards Commercial Standards CS45-42. Stud spacing shall not exceed 12" c.c. when 5/8" plywood is used. Where 3/4" plywood is used stud spacing shall be not greater than 16" c.c. when the sheets are run horizontally (3-plys working) or 12" c.c. when the sheets are run vertically (2-plys working). Full sized sheets of plywood shall be used, except where smaller pieces will cover an entire area. The joints between adjacent sheets of plywood shall, where practicable, coincide with the vertical or horizontal rustication marks as shown on the drawings. The edges of all plywood sheets shall be straightened on the bench to insure close fitting tight joints. All vertical joints shall be backed solidly and the edges of abutting sheets shall be nailed to the same stud with 6d box nails not more than 8 inches apart. Wherever panel forms are permitted by the Architect the joints shall be so constructed to comply with the above requirements.

(c) Where lined forms are used, the backing for form lining, shall be constructed of a good grade of form lumber that is solid, straight, and free from defects that might impair its strength but need not be of the quality used for contact forms. Square-edged sized lumber may be used for form boarding in place of shiplap or T & G. Form boarding for lined forms may be horizontal or vertical depending upon convenience. Form sheathing shall be securely nailed to studs and the edges of the boards shall be in contact to prevent any bulging of the lining.

Non-warping fibre board not less than 3/16 inch in thickness or 1/4 inch Douglas fir plywood form liner shall be securely nailed to the form sheathing. The joints between adjacent sheets of liner shall as far as practicable coincide with the vertical and/or horizontal rustication strips as shown on the drawings.

(d) The lining material shall be nailed to the backing beginning at the center of the sheet and working outward toward the edges to prevent buckling. 3d blue shingle nails or similar nails with thin flat heads shall be used to attach lining material to sheathing. The nails shall not be farther apart than 8 inches along the edges and there shall be at least one nail for every square foot of surface. Fiber board where used shall be thoroughly wet with water at least 12 hours before being fastened to the form sheathing. The water shall be applied to the screen side of the board and the boards shall be stacked screen side to screen side.

(e) In general, the reuse of any material in contact with the concrete shall be subject to the Architect's approval. Prior to placement of any concrete the Architect shall be notified and permitted to inspect the forms. If in the opinion of the Architect the pointing of an occasional slightly open joint will prevent leakage, then such pointing shall be done using a mixture of equal parts of beef tallow and Portland cement. All such pointing shall be carefully done so that no trace of the pointing mixture remains on the inside face of the forms. Open joints which cannot be satisfactorily repaired by pointing shall be sufficient cause for rejection of forms.

5-15. Concrete Surfaces:

(a) All exposed concrete surfaces (Architectural Concrete) shall have a smooth finish free from joint marks, fins, honeycombing, excessive air pockets and common grain markings. Bulges or depressions shall not exceed 3/16 inch in four (4) feet. All exposed corners shall be chamfered one (1) inch unless otherwise shown on the drawings.

(b) Exposed concrete surfaces on the exterior (Architectural Concrete) and in finished areas on the interior of the building shall be formed with lined or unlined forms as specified under paragraph 5-14.

(c) Concealed concrete surfaces (Structural Concrete) and concrete surfaces in unfinished areas of the building shall be formed with panel forms of metal or wood of a designed approved by Architect. Forms shall comply with design requirements of Paragraph 5-13. Surfaces to be left exposed in the completed structure shall have projecting ridges dressed off flush and pitting pointed flush. Surfaces to be painted shall be ground off to a reasonably true plane.

5-16. Form Ties:

(a) Form ties approved by the Architect shall be used. They shall have a minimum working strength when fully assembled of at least 3,000 lbs. Ties shall be so adjustable in length as to permit tightening of forms and such type as to leave no metal closer than 1-1/2" of the surface and they shall not be fitted with any lugs, cones, washers

or other device to act as a spreader within the form or for any other purpose which will leave a hole larger than 7/8" in diameter or a depression back of the exposed surface of the concrete. Wire ties will not be permitted.

(b) Ties that are to be pulled from the wall shall be coated with cup grease or other approved material to facilitate removal.

(c) Tie rods that are to be entirely removed from the wall shall be loosened 24 hours after the concrete is placed. All but a sufficient number of ties to hold the forms in place may be removed at that time but the forms shall be held in position not less than 5 days except that 3 days shall be considered sufficient if high early strength Portland cement or concrete is used, but in no case shall ties or forms be removed until the concrete has hardened sufficiently to permit removal without damaging the concrete. Care shall be exercised to avoid spilling the concrete on the exposed surface. Ties of uniform diameter that are wholly withdrawn from the wall shall be pulled toward the inside face. Cutting ties back from the face of the wall will not be permitted.

(d) Tie rod holes shall be plugged as specified in Paragraph 19(a).

5-17. Wetting and Oiling Forms:

(a) The inside surface of wood board forms shall be soaked with clean water and dept continuously wet for 12 hours before any concrete is placed. In case forms have been erected for some time and have become dry so that joints have opened, then the forms shall be thoroughly soaked at least twice each day for at least 3 days prior to placing concrete. If the forms cannot be tightened to the satisfaction of the Architect they shall be torn down and rebuilt. Plywood and fiber board forms shall be treated with an approved form oil or lacquer. If oil is used all excess oil shall be wiped off with rags to leave the surface of the forms just oily to the touch.

(b) Coatings of dust shall be removed from contact surfaces of forms before placing concrete. Concrete shall not be placed in any form until inspected by the Architect and permission is given to start placing.

5-18. Removal of Forms:

(a) No forms shall be removed in less than five (5) days unless specific approval is given by the Architect. Where the structure as a whole or any part thereof is supported on shores, the supporting forms or shores shall in no case be removed until the members have acquired sufficient strength as determined by the Architect to safely support their weight and the loads thereon.

5-19. Placing Reinforcement:

(a) Place reinforcement accurately in position shown, securely fastened and supported to prevent displacement before and during pouring. Before placing thoroughly clean reinforcement of rust, mill scale or any coatings which would reduce or destroy the bond. Splices in reinforcement where permitted, shall provide a sufficient lap to transfer the stress between bars by bond and shear.

(b) Unless otherwise shown concrete covering over reinforcement shall be 1½" for beams and girders, 3/4" for solid slabs, 2" for walls, and columns, and 3" for footings. Minimum clear spacing between reinforcement shall not be less than 1", nor less than the nominal diameter of bars, nor less than one and one-third times the maximum size of the coarse aggregate.

(c) Support reinforcement in slabs and beams with chairs and supports of sufficient size and number to carry reinforcement in position shown without sag. Tie reinforcement at all intersections and splices with #18 gauge black annealed wire. Point wire tie ends away from forms. Bend reinforcement in accordance with approved bending diagrams. Bars with kinks or bends not shown shall not be used. Heating of reinforcement for bending will not be permitted.

5-20. Inserts and Fastening Devices:

(a) Provide for installation of inserts, hangers, metal ties, anchors, bolts, angle guards, stair nosings, dowels, thimbles, slots, nailing strips, blocking, grounds and other fastening devices required for attachment of other work. Properly locate in cooperation with other trades and secure in position before concrete is poured. Do not install sleeves in any concrete beams, joists or columns except upon approval of the Architect.

(b) Where concrete walls, columns, or beams more than 16" in height are veneered with masonry, build metal anchor slots or inserts into concrete; space inserts not over 24" apart horizontally and not over 14" apart vertically. Dovetail slotted masonry anchors are specified under "Masonry".

5-21. Proportioning of Concrete Mixes:

(a) Architectural Concrete shall be proportioned and mixed to provide a 28 day strength of 3750 pounds per square inch; Structural Concrete shall have a 28 day strength of 3000 pounds per square inch. In no case shall concrete contain less than 5½ sacks of cement per cu. yard.

(b) Portland cement in standard unopened cloth or paper sacks as packed by the manufacturer may be considered as weighing 94 pounds per sack. Batches shall be so proportioned that only full bags of cement are required for a single batch.

(c) Coarse aggregate shall be used in the greatest amount consistent with required workability and shall be of the largest size suitable for the work. However, the combined aggregate (coarse and fine) shall be of such composition of sizes that when separated by the No. 4 standard sieve, the per cent retained shall not be less than one-half nor more than two-thirds of the total weight based on dry materials for Architectural Concrete, and not less than 30% nor more than 50% for Structural Concrete.

(d) Air-entrained concrete shall be used for all concrete in the structure and related work. This concrete shall contain not less than 4 nor more than 7 per cent entrained air. The quantity of air entraining agent if used shall be as determined by trial design batches. The method of introducing the air entraining agent into the concrete mixture shall be as recommended by the manufacturer. Where the air entraining agent is deluted with water to facilitate addition to the mix, the amount of water used shall be considered a part of the mixing water.

(e) Corrective additions to remedy deficiencies in aggregate gradations shall be used only with the specific approval of the Architect. When such additions are permitted the material shall be measured separately for each batch of concrete.

(f) The concrete mixes used for both Architectural and Structural Concrete shall be based on proportions established by a competent testing laboratory approved by the Architect. Results of laboratory tests including 7 and 28 day strengths shall be furnished the Architect not less than fourteen (14) days prior to the placement of any concrete. During the progress of the work adjustments in the mix shall be made as directed by the Architect to insure satisfactory strength and finish. No substitutions shall be made in the materials used in the work without additional tests in accordance herewith to show that the quality of the concrete is satisfactory.

(g) Slump tests for consistency of concrete shall be conducted in the field in accordance with Standard Method of Tests for Slump of Portland Cement Concrete, ASTM Designation: C143-52. Slump shall be not less than three (3) inches or more than five (5) inches for the concrete in structural members, and 2" to 4" for slabs on grade unless otherwise directed by the Architect.

5-22. Job-Mixed Concrete:

(a) Concrete shall be mixed by a mechanical batch type mixing plant provided with adequate facilities for accurate measurement and control of each material entering the mixer and for changing the proportions to conform to varying conditions of the work.

(b) The batching unit shall be supplied with the following items:

(1) Weighing unit shall be provided for each type of material to indicate the scale load at convenient stages of the weighing operation. Weighing units shall be checked at times directed by and in the presence of the Architect, and required adjustments shall be made before further use.

(2) Water mechanism shall be tight with the valves interlocked so that the discharge valves cannot be opened before the filling valve is fully closed, and shall be fitted with a graduated gauge.

(3) Discharge gate shall control the mix to produce a ribboning and mixing of cement and aggregate. Delivery of materials from the

batching equipment to the mixer shall be accurate within the following limits:

Material	% By Wt.
Cement.	1/2
Water	1/2
Fine Aggregate.	1
Coarse Aggregate.	2

(c) Mixers shall not be charged in excess of rated capacity nor be operated in excess of rated speed. Excessive mixing, requiring addition of water to preserve required consistency will not be permitted. The entire batch shall be discharged before recharging.

(d) Mixing time shall be measured from the instant water is introduced into the drum containing all solids. All mixing water shall be introduced before one-fourth (¼) of the mixing time has elapsed. Mixing time for mixers of one (1) cubic yard capacity or less shall be 1½ minutes; for mixers larger than 1 cubic yard the mixing time shall be increased 15 seconds for each additional half cubic yard capacity or fraction thereof. If an air entraining agent is used, mixing time shall be as determined by mixing full size trial batches using the same mixer and ingredients as will be used in the work. Air content of trial batches shall be determined by the Standard Method of Test For Air Content of Freshly Mixed Concrete by the Pressure Method ASTM Designation: C173-55T, or by the Gravimetric Method ASTM Designation: C138-44. Concrete produced from such trial batches shall be used in the work only if approved by the Architect and in such locations as he shall direct.

(e) A device to lock the discharge mechanism until the required mixing time has elapsed shall be provided on each mixer, unless waived by the Architect.

5-23. Ready-Mixed Concrete:

(a) Ready-mixed concrete may be used, providing the concrete conforms to Tentative Specifications for Ready-Mixed Concrete ASTM Designation: C94-55T.

(b) It shall be the responsibility of the contractor to maintain a proper and uniform air content as determined by test at the job site and variations in air content beyond the specified limits for two consecutive tests shall be sufficient cause for rejection of all concrete until evidence of adequate corrective measures has been furnished the Architect.

5-24. Expansion, Construction, and Control Joints:

(a) Expansion joints shall be constructed as indicated on the drawings or as approved by the Architect. In no case shall the reinforcement, corner protection angles, or other fixed metal items embedded in or bonded into concrete, be run continuous through an expansion joint. Edges of concrete floors or slabs shall be neatly finished with a slightly rounded edging.

(b) The unit of operation shall not exceed 80 feet in any horizontal direction without a construction joint, unless otherwise approved by the Architect. Concrete shall be placed continuously so that the unit will be monolithic in construction. At least 48 hours shall elapse between casting of adjoining units unless this requirement is waived by the Architect.

(c) Construction joints, if required, shall be located near the mid-point of spans for slabs, beams, or girders unless a beam intersects a girder at its center in which case the joints in the girder shall be offset a distance equal to twice the width of the beam and provision for shear shall be made by use of inclined reinforcement. Joints in columns or piers shall be made at the underside of the deepest beam or girder framing thereto, unless otherwise shown on the drawings. Columns, piers or walls of ordinary height shall be cast at least 2 hours before any overhead work is placed thereon. Joints not shown or specified shall be so located as to least impair the strength and appearance of the work and their location shall be subject to approval by the Architect. Vertical joints in wall footings shall be reduced to a minimum. Except where indicated on the drawings no jointing shall be made in footings or foundation work without specific approval of the Architect.

(d) Placement of concrete shall be at such rate that surfaces of concrete not carried to joint levels will not have attained initial set before additional concrete is placed thereon. Girders, beams, and slabs shall be placed in one operation. In walls having door or window openings, lifts of individual pours shall terminate at the top and bottom of such openings. Other lifts shall terminate at such levels as are indicated on the drawings, or as conforming to structural requirements or architectural detail, or both, as directed by the Architect.

(e) To insure a level straight line in exposed vertical surfaces, a grade strip of dressed lumber may be tacked to the inside of the forms at construction joints and concrete placed to a point one (1) inch above the under side of the strip. The strip shall be removed one (1) hour after the concrete has been placed and any irregularities in the joint line leveled off with a wood float and all laitance removed. The use of such grade strips will be restricted to locations approved by the Architect.

(f) Control joints shall be as detailed on the drawings and accurately located to comply with design requirements. Extreme care shall be taken to assure that the break point of reinforcing bars designated to be cut or stopped at control joints coincides exactly with the center line of the joint as shown on the drawings.

5-25. Preparation for Placing:

(a) Water shall be removed from excavations before concrete is deposited. Any flow of water shall be diverted through proper side drains and shall be removed without washing over freshly deposited concrete. Hardened concrete, debris and foreign materials shall be removed from interior of forms and from inner surfaces of mixing and conveying equipment. Wood forms for concrete that is to be painted

shall be coated with sealer. Other wood forms, unless lined, shall be oiled or, except in freezing weather, wet with water in advance of concrete placement to prevent seepage of cement grout from the mix. Reinforcement shall be secured in position, inspected and approved by the Architect before placing concrete. All concrete placed in violation of this provision shall be rejected and removed. Runways, or other means approved by the Architect, shall be provided for wheeled equipment to convey concrete to the points of deposit. Equipment used to deposit concrete shall not be wheeled over reinforcement nor shall runways be supported on reinforcement.

5-26. Placing Concrete:

(a) Concrete shall be handled from mixer or transport vehicle to place of final deposit in a continuous manner and as rapidly as practicable until the given unit of operation, approved by the Architect, is completed. Concrete that has attained its initial set or has contained its water content for more than 1½ hours shall not be used in the work. Forms or reinforcement shall not be splashed with concrete in advance of placing operation. Concrete shall be deposited in the forms in uniform layers not exceeding 18 inches in depth amd as nearly as practicable in final position to avoid rehandling.

(b) Immediately after depositing, concrete shall be compacted by thoroughly agitating in a manner approved by the Architect, to force out air pockets, work the mixture into corners and around reinforcement and inserts, and prevent formation of voids. Tapping or other external vibration of forms will be permitted only when directed by the Architect to insure a smooth dense exposed surface. Concrete shall not be placed on concrete sufficiently hard to cause formation of seams and planes of weakness cold joints within the section.

(c) Concrete shall not be allowed to drop freely more than five (5) feet in unexposed work nor more than three (3) feet in exposed work. Where greater drops are required, a tremie or other means approved by the Architect shall be employed. The discharge of tremies shall be controlled so that the concrete may be effectively compacted into horizontal layers not more than 18 inches thick and the spacing of the tremies shall be such that segregation does not occur.

(d) Concrete footings shall be placed upon undisturbed clean surfaces, free from frost, ice, mud and water.

5-27. Cold Weather Placing of Concrete:

(a) Unless otherwise approved by the Architect, concrete shall be mixed and placed when the temperature, in the shade and away from artificial heat is at least 40° F., and if less than 45°F., it shall be rising.

(b) For placing at lower temperatures, when permission is obtained from the Architect, all materials shall be heated and otherwise prepared so that batching and mixing can proceed as specified. Means shall be provided for maintaining the concrete at a temperature of at least 50° F. for seventy-two (72) hours after placing except where high early strength cement or concrete is used this period

may be reduced to forty-eight (48) hours. Methods proposed for heating materials and protecting the concrete shall be approved by the Architect.

(c) Salt, chemicals, or other materials shall not be mixed with concrete to prevent freezing. Accelerating agents shall not be used except when necessary to place concrete in existing or probable ambient temperatures of below 40° F.; then calcium chloride shall be introduced into the concrete as an accelerating agent in accordance with the provisions of Paragraph 5-7 (b). If no calcium chloride is used the curing period as given in paragraph (5) shall be increased to seven (7) days.

5-28. Chute or Pump Placement of Concrete:

(a) Chute placement of concrete shall be approved by the Architect. Concrete shall be placed in a continuous flow. The chute shall be of metal or metal-lined wood, with sections set at approximately the same slope; namely, not less than 1 vertical to 3 horizontal nor more than 1 vertical to 2 horizontal. The discharge end of the chute shall be provided with a baffle plate to prevent segregation. If the height of the discharge end of the chute is more than 3 times the thickness of the layer being deposited but not more than 5 feet above the surface of concrete in the forms, a spout shall be used and the lower end maintained as near the surface of the fresh concrete as practicable. When placing is intermittent the chute shall discharge into a hopper. The chute shall be thoroughly cleaned before and after each run and waste material and flushing water will be discharged outside the forms.

(b) Where concrete is conveyed and placed by pumping, the plant and equipment shall be approved by the Architect. Operation of the pump shall be such that a continuous stream of concrete without air pockets is produced. When pumping is completed, concrete to be used remaining in pipe line shall be ejected without contamination of concrete or separating of ingredients. After each operation equipment shall be thoroughly cleaned and debris and flushing water wasted outside the forms.

5-29. Compaction:

(a) Concrete shall be placed in layers not over 18 inches deep and each layer shall be compacted by mechanical internal vibrating equipment supplemented by hand-spading, rodding, and tamping as directed by the Architect. Vibrators shall in no case be used to transport concrete inside the forms. The use of form vibrators will not be permitted. Internal vibrators shall maintain a speed of not less than 5000 vibrations per minute when submerged in the concrete. At least one (1) spare vibrator of an approved type and in good working order shall be maintained as a relief during all placing operations.

(b) The duration of the vibration shall be limited to the time necessary to produce satisfactory consolidation without objectionable segregation and shall be at least 20 seconds per square foot of exposed surface. Extreme care shall be taken to prevent the vibrator from being inserted into lower courses of concrete that have begun to set. Vibrators shall be applied at uniformly spaced points not further apart than the visible effects of the machine.

5-30. Bonding and Grouting:

(a) Before depositing new concrete on or against concrete that has set, existing surfaces shall be thoroughly roughened and cleaned of laitance, foreign matter and loose particles. Forms shall be retightened and existing surfaces slushed with a grout coat of neat cement. New concrete shall be placed before the grout has attained i initial set.

(b) Horizontal construction joints shall be given a brush coat of grout consisting of cement and fine aggregate in the same proportion as the concrete to be placed, followed by approximately 3 inches of concrete of regular mix, except that the proportion of coarse aggregate shall be reduced 50 per cent.

(c) Grout for setting column bases, wall plates and other metal items shall be composed of equal parts of sand and Portland cement, with water sufficient to produce the required consistency.

5-31. Concrete Floor and Roof Slab:

(a) Floor and roof slabs shall be struck off true to the required level at elevation or grade shown on drawings. Slabs shall be left with a tolerance of $\frac{1}{4}$" in 10 feet, except where drains occur or a definite slope is given, in which case the slab shall be finished to the lines and grades shown on the drawings, or as directed by the Architect.

(b) All concrete slab surfaces, except where indicated on drawings as Monolithic Finish, shall be finished by tamping the concrete with special tools to force the aggregate away from the surface, then screeding with straight edges and floating to produce a reasonable true and uniform surface.

(c) Floor slabs to receive cement topping, terrazzo, ceramic tile or similar floor finishes shall be screeded only. In addition to screeding, slabs to receive topping shall be raked to provide a rough "toothed surface to increase the bond between the topping and base slab.

(d) Top surfaces of concrete canopies without roofing shall be troweled smooth. Cement Topping and Monolithic Finishes are specified under "Cement Finishes".

5-32. Finishes of Concrete Other Than Floors:

(a) Any concrete which is not formed as shown on the plans or for any reason is out of alignment or level or shows a defective surface shall be considered as not conforming with the intent of these s specifications and shall be removed from the job by the contractor at his expense unless the Architect grants permission to patch the defective work if the patching does not, in his opinion, satisfactorily restore the quality and appearance of the surface.

(b) After removing forms all concrete surfaces shall be inspected and any poor joints, voids, stone pockets or other defective areas permitted by the Architect to be patched and all tie holes shall be patched. Where necessary defective areas shall be chipped away to a depth of not less than 1 inch with the edges perpendicular to the surface. The area to be patched and a space at least 6 in. wide entirely surrounding it shall be wetted to prevent absorption of water from the patching mortar. A grout of equal parts Portland cement and sand, with sufficient water to produce a brushing consistency, shall then be well brushed into the surface, followed immediately by the patching mortar.

(c) The patch shall be made of the same material and of approximately the same proportions as used for the concrete except that the coarse aggregate shall be omitted. The mortar shall not be richer than 1 part cement to 3 parts sand. White Portland cement shall be substituted for a part of the gray Portland cement to match the colorr of the surrounding concrete. The proportion of white and gray cements shall be determined by making a trial patch. The amount of mixing water shall be as little as consistent with the requirements of handling and placing. The mortar shall be retempered without the addition of water by allowing it to stand for a period of 1 hour during which time it shall be mixed with a trowel to prevent setting.

(d) The mortar shall be thoroughly compacted into place and screeded off so as to leave the patch slightly higher than the surrounding surface. It shall then be left undisturbed for a period of 1 to 2 hours to permit initial shrinkage before being finally finished. The patch shall be finished in such a manner as to match the adjoining surface. On exposed surfaces where unlined forms have been used the final finish shall be obtained by striking off the surface with a straightedge spanning the patch and held parrallel to the direction of form marks. All patches shall be cured in accordance with Paragraph 5-34.

(e) Tie holes left by withdrawal of rods or the holes left by removal of ends of ties shall be filled solid with mortar after first being thoroughly wetted. For holes passing entirely through the wall a plunger type grout gun shall be used to force the mortar through the wall starting at the back face. A piece of burlap or canvas shall be held over the hole on the outside and when the hole is completely filled the excess mortar shall be struck off with the cloth flush with the surface. Holes not passing entirely through the wall shall be filled with a small tool that will permit packing the hole solid with mortar. Any excess mortar at the surface of the wall shall be struck off flush with a cloth.

5-33. Grout Clean-Down:

(a) Grout clean down **of exterior concrete surfaces shall be included as a part of the base bid.**

(b) No cleaning operations shall be undertaken until the "Architectural Concrete" surfaces of the building are entirely completed, including all patching and filling of tie holes. Cleaning portions of the walls as the work progresses will not be permitted. No cleaning operations will be permitted unless the air temperature is greater than 50°F.

(c) Mix 1 part Portland cement and 1½ parts fine sand with sufficient water to produce a grout having the consistency of thick paint. White Portland cement shall be used for all or part of the cement in the grout, as directed by the Architect, to give the color desired. Wet the surface of the concrete sufficiently to prevent absorption of water from the grout and apply the grout with brushes or a spray gun uniformly, completely filling air bubbles and holes.

(d) Immediately after applying the grout, float the surface with a cork or other suitable float, scouring the wall vigorously. While the grout is still plastic the surface shall be finished with a sponge rubber float removing all excess grout. This finishing shall be done at the time when grout will not be pulled from holes or depressions. Next allow surface to dry thoroughly, then rub it vigorously with dry burlap to completely remove any dried grout. There shall be no visible film or grout remaining after this rubbing. The entire cleaning operation for any area must be completed the day it is started. No grout shall be left on the wall over night.

(e) After the surfaces to be treated have been grout cleaned, if any slightly dark spots or streaks remain they shall be wiped off lightly with a fine abrasive hone without using water but the rubbing with the hone shall not be sufficient to change the texture of the concrete. This final operation shall be included as a part of the grout cleaning.

5-34. Protection and Curing:

(a) Curing may be accomplished by effectuve protection of all exposed surfaces against moisture loss or by water curing method as hereinafter specified.

(b) Protect concrete surfaces, not covered by forms, from loss of surface moisture for not less than 7 days where a normal Portland cement has been used or 3 days where a high-early strength Portland cement has been used by covering with plastic film sheets (as hereinafter specified for vapor barrier), kraft paper mats, or burlap, lapped 4 inches at edges and ends. Kraft paper laps shall be sealed. Burlap may be used only for unexposed surfaces and shall be in not less than 2 layers.

(c) Surface from which forms are removed before the curing period has elapsed shall be protected as specified for surfaces not covered by forms. Membrane curing shall not be used on surfaces to receive concrete fill nor on cement finishes to receive dustproofing and hardening treatments.

(d) Water curing shall be effected by keeping forms sufficiently wet with clean water to reduce cracks and to prevent joints in forms from opening, and by keeping other protective material thoroughly and continuously wet, to prevent hair cracks from occurring in the surface of the concrete. During damp periods the amount of water used shall be sufficient to keep the forms or covering only moist.

5-35. Samples and Testing:

(a) Testing of all materials including aggregates, trial design mixes, strength test cylinders, slump tests and entrained air content tests shall be the responsibility of the contractor and unless otherwise specified herein shall be made when and as directed by the Architect. The testing agency and test equipment shall be approved by the Architect.

(b) Strength test of concrete during work shall be made and cured in accordance with Standard Method of Test for Compressive Strength of Molded Concrete Cylinders ASTM Designation: C39-49. Contractor shall provide for test purposes one set of three (3) cylinders taken from each 100 cubic yards or fraction thereof, or each day's pour, whichever is less.

(c) Specimens shall be cured under laboratory conditions except that the Architect may require curing under field conditions when he considers that there is a possibility of the air temperature falling below 40° F. The test result shall be the average of the strengths of the three cylinders except that if one of the cylinders in a test shows evidence of improper sampling, molding or testing, the test result shall be the average of the remaining two cylinders. If two cylinders show such defects, the test shall be discarded. The standard age of test shall be 28 days and 7 day tests may be used, with the permission of the Architect, provided that the relation between the 7 day and 28 day strengths of the concrete is established by tests for the materials and proportions used.

(d) If the average of the strength tests of the laboratory control cylinders for any portion of the structure falls below the minimum allowable compressive strength at 28 days required for the class of concrete used in that portion of the structure, the Architect shall have the right to order a change in the proportions or the water content of the concrete, or both, for the remaining portions of the structure at the contractor's expense. If the average strength of the cylinders cured on the job fall below the minimum allowable compressive strength, the Architect may require changes in the conditions of temperature and moisture necessary to secure the required strength.

(e) Tests of hardened concrete may be required by the Architect where there is a question as to the quality of concrete in the structure. The tests shall be made in accordance with Standard Methods of Securing, Preparing, and Testing Specimens from Hardened Concrete for Compressive and Flexural Strengths, ASTM Designation: C42-49.

(f) Load tests, for that portion of the structure where the questionable concrete has been placed, shall be made at the contractor's expense when required by the Architect. Load tests shall be made in accordance with Section 202 of the ACI Building Code (ACI 318-46). In the event that load tests indicate that concrete placed does not conform to the drawings and these specifications, measures as prescribed by the Architect, shall be taken to correct the deficiency and the cost of all such remedial measures shall be the responsibility of the contractor.

(g) Tests for air entrained content of concrete shall be made for each concrete pour, or as directed by the Architect.

Samples of fresh concrete for the determination of weight per cubic foot and per cent of air shall be obtained, if possible, from the site of the pour after the concrete is in place and consolidated. When job conditions prevent sampling the concrete after placement the sample shall be secured from the point at which it is dumped into theforms. The weight per cubic foot of fresh concrete, percent of air and slump shall be determined from each sample so obtained.

5-36. Monolithic Floor Slabs on Earth:

(a) Refer to drawings for slab thickness, reinforcement, and expansion joints required.

(b) Floor shall be poured in place in alternating panels and contraction joints shall be provided in the slabs at locations shown on the drawings. Floor reinforcement shall terminate on either side of the keyed construction joints as shown on the drawings. Contraction joints shall be 1½" deep and can be a tooled joint or may be made by saw cut to provide a joint 1½" deep. Finish shall be Monolithic as specified under "Cement Finishes".

5-37. Concrete Foundations for Mechanical Equipment:

(a) The concrete pads required under boilers, fans, condensate pumps, receivers, and for all bases and curbs specifically noted as being furnished by the General Contractor in the Mechanical Plans and Specifications, shall be included under this section of the specifications. Concrete shall be of same type as specified for floor slabs and shall have a smooth integral finish. Set bolts, anchors, piping, etc., in concrete as required by the manufacturer of equipment used, and as obtained and directed by the Mechanical Contractors. All concrete pads on grade shall be placed independent of the floor slab and shall be insulated from the floor slab by the use of an approved expansion joint filler, as described elsewhere in this specification. Exact sizes and locations shall be obtained from Plumbing and Heating Contractor at time of construction.

5-38. Concrete Drives Etc.,

(a) Concrete Drives, entrance platforms, etc., which are shown on drawings as being a part of this contract, shall be installed by the General Contractor.

(b) Furnish and install a six (6) inch minimum crushed rock base sand for all Drives. Provide continuous expansion joints adjacent to the buildings, platforms, steps, etc., and elsewhere as indicated by drawings.

(c) All Drives shall be five (5) inches thick unless otherwise shown on the drawings. Expansion joints shall be of the thickness required and at the location shown on the drawings and shall extend through the full thickness of the concrete slabs. Tooled joints as shown on the drawings shall be cut not less than one and one-quarter (1¼) inches deep and may be made by a thin metal form which shall be removed prior to tooling the edges of the joint or by sawing. All

edges of Drive slabs shall be tooled. Where curbs are removed build new curbs integrally with drives as directed by Architect.

(d) All drives shall be graded to an even slope to member with adjacent walks, building entrance platforms, etc. Elevations are given on the drawings to indicate the Drives finish lines. Surface of Drives shall have a crown or slope to one side in the same direction as the topography, of 1/4 in. per foot. Finish is to be monolithic with cork or wood floats or at the option of the Architect a soft broom finish shall be used to provide a reasonably non-slip surface. Reinforce all drives with 6" x 6" #10/#10 mesh.

5-39. Concrete Service Tunnels:

(a) Construct all concrete service tunnels for this project as shown on the site work drawing, Sheet #1 and the structural drawings. All excavation, grading and concrete work for tunnels shall be as specified under divisions 4 and 5, unless otherwise specified herein.

(b) Construction and expansion joints shall be constructed as detailed on the drawings. In no case shall the reinforcement or other fixed metal items embedded in or bonded into concrete, be run continuous through expansion joints.

(c) The unit of operation shall not exceed 100 feet in any horizontal direction without a construction joint. Concrete shall be placed continuously so that the unit will be monolithic in construction. At least 48 hours shall elapse between casting of adjoining units unless this requirement is waived by the State Architect.

(d) In the event the contractor wishes to pour concrete in units less than the 100 lineal feet as shown between station points, the construction joint as detailed on the drawings shall apply.

(e) Waterstops in construction and expansion joints as shown and detailed on drawings shall be "Durajoint", No. 4, 6" as manufactured by W.R. Meadows, Inc., Elgin, Illinois, or an approved equal.

(f) Expansion joint filler shall be premolded expansion joint filler similar to Celotex Co., "Flexcell", composed of Fiberboard impregnated with asphalt. Joint material shall be 1" thick.

(g) Waterstops and joint fillers shall be continuous around perimeter of tunnels. All splices shall be made in a manner approved by the manufacturer and shall be a tight waterproof splice.

(h) Before depositing new concrete on or against concrete which has set, the existing surfaces shall be thoroughly roughened and cleaned of foreign matter and loose particles. Grout existing concrete surface with thin coat of neat cement prior to joining new concrete.

(i) All tunnel floor slabs shall be given a wood float finish. Tops of tunnels above grade, used as part of the sidewalk system shall be finished same as sidewalks. Tunnel top shall be poured of air entrained concrete.

5-40. Vapor Barrier and Waterproofing Film:

(a) Furnish and install a polyethylene film over gravel sub-grade of first floor and basement floor areas before pouring concrete floor slab. Polyethylene film shall be similar and equal to "Visqueen" manufactured by the Visking Corporation Plastics Division, P. O. Box 1410, Terre Haute, Indiana. Film shall be of 4 mil. (.004") thickness, of any standard width (available up to 16"-0" widths). The film shall be lapped not less than 6" with the top lap placed in the direction of the spreading of the concrete.

5-41. Special Precautions:

(a) The General Contractor shall take every precaution to place accurately all anchor bolts, dovetail anchor slots, steel railing sleeves, threshold anchor bars, sleeves for plumbing lines, trench drains, and all other devices required by the drawings and necessary for the construction of the various parts of the Building.

(b) The General Contractor shall consult with each of the other principal contractors before each pour of concrete to be sure that all equipment to be installed in their work has been installed and is in readiness for the concrete work to proceed.

5-42. Adjustment in Footing Elevations:

(a) From the information obtained from excavation work, the Architect may raise or lower the footings from the designed elevations to meet actual sub-surface conditions. Contract price will be adjusted according to unit prices set out in contractor's proposal for concrete.

5-43. Unit Prices:

(a) The Contractor shall state, in the space provided in the proposal, unit prices to govern all additions to or reductions from the concrete work as follows:

(1) General Concrete Work: For one cu. yd., in place, including all material, labor, forms and reinforcing.

(2) Plain Concrete Work: For one cu. yd., in place.

5-44. Shop Drawings:

(a) Refer to Paragraph 5-11 for bending diagram requirements. Shop drawings shall show bending diagrams, assembly diagrams, splicing and laps of rods, shapes, dimensions and details of bar reinforcing and accessories. Shop drawings shall show all openings where stairs, ducts, etc., pass through floors and roof construction; see mechanical drawings for location. Shop drawings must be approved by the Architect before proceeding with the work. Submit shop drawings of special form construction for Architect's approval. It is important that special care be given in the planning and layout of the form work for the architectural concrete portions of the structure.

6 - CEMENT FINISHES

6-1. Scope:

(a) Furnish all labor, materials and equipment, and perform all operations in connection with the installation of cement topping, cement base, and integral cement finish on floors, and stairs in strict accordance with the specifications and the drawings, and subject to the terms and conditions of the contract.

6-2. General:

(a) Floor topping shall be one (1) inch thick unless otherwise shown on the drawings. Topping under floor coverings shall finish at the required height so that the surface of the floor covering material shall be flush with the adjacent floor finish.

6-3. Preparation:

(a) Just prior to placing topping, roughen slab as required to provide mechanical bond. Remove loose particles of sand and dirt with stiff broom or wire brush. Remove oil grease spots by washing with 10% solution of muriatic acid or strong washing soda. After cleaning, hose down slab with pressure hose and keep wet for at least 6 hours. Allow slab to dry until surface water has disappeared.

6-4. Mix for Topping & Base:

(a) Mix for cement topping and cement base shall be composed of one part cement and three parts of sand and not more than 4 1/2 to 5 gallons of water per sack of cement, to produce the stiffest mortar that can be trowelled. Mixer shall be operated for full two minutes after the batch is in the mixer.

6-5. Placing Topping and Base:

(a) On the wet slab surface, apply a thin neat cement grout, broomed into surface a short distance ahead of topping mixture. Spread topping over slab evenly and work into place by tamping, rolling, floating, and trowelling. Slope floors to drains as required. See that metal divider strips are properly installed before placing topping.

(b) Run base in place to profile shown and trowel smooth. Provide permanent and temporary screeds as necessary. Toe of coved base shall finish flush with finished floor. Metal base bead in rooms specified shall be as called for by drawings.

6-6. Topping Finish:

(a) Screed topping to a true and even surface, then float and trowel smooth. Do not float or trowel surface until water sheen has disappeared from surface. After topping has set sufficiently to ring trowel, give surface second trowelling to a smooth but not glassy finish.

6-7. Monolithic Float Finish:

(a) All exterior concrete platforms, aprons, and steps shall have monolithic float finish. Tamp with special tools to force aggregate from surface. Then screed with straight-edges to bring surfaces to elevations shown. While concrete is green, but hardened sufficiently to bear cement finisher's weight, float surfaces with wood float to a true and uniform plane with no coarse aggregate visible. Dusting to absorb surface water will not be permitted.

6-8. Monolithic Smooth Finish:

(a) All interior floors scheduled for monolithic finish shall have smooth troweled finish. After surface has been screeded and floated as specified for monolithic float finish, hand-trowel to produce a smooth supervious surface free from trowel marks. After concrete has set sufficiently, give surface second troweling to a smooth but not glassy finish.

6-9. Power Machine Finishing:

(a) Cement floors may be finished with power machine in lieu of hand finishing if machine is approved by Architect. Preparation of slab, mixing of topping and application of topping for machine finishing shall be in general as hereinbefore specified for hand finishing. Method of finishing by machine shall conform with the directions of the power machine manufacturer.

6-10. Metal Edging Strips:

(a) Provide brass edging strips where floor covering butts against finish cement floors at borders, door openings, and other locations. Edging strips shall have 1/8 inch top, recess equal to thickness of floor covering and 3/4 inch wide for 1 inch topping or 1 1/4 inch for 1 1/2 inch topping.

6-11. Curing:

(a) Cement topping shall be properly cured by keeping wet for four days and then allowed to dry slowly.

6-12. Floor Hardener:

(a) All concrete floors and ramps scheduled for Monolithic Concrete or Cement Topping shall be treated with a colorless solution containing a chemically active hardening agent. This material shall be Sonneborn's Lapidolith, equivalent A. C. Horn, Master Builders or as approved.

(b) After cement floors have been cured and dried, these surfaces shall be cleaned and given one saturate coat of floor hardener in exact accordance with directions of manufacturer.

6-13. Protection and Cleaning:

(a) Smooth finished cement floors not scheduled for floor coverings shall be covered and protected with stain proof paper after being treated with floor hardener. Where cement finish is soiled, clean with linseed oil soap as required to place floors in a first class condition.

6-14. Waterproof Protection:

(a) Apply 3/4 inch coat of cement mortar over all membrane waterproofing where indicated by drawings. Cement mortar mix to be 1 part Portland cement, 1/4 part lime putty and 3 parts sand by volume. Apply cement mortar over membrane waterproofing in strips of not more than 6' 0" high. As soon as mortar has set, backfill with earth and apply another 6' 0" strip of mortar.

7 - MASONRY WORK

7-1. Scope:

(a) Furnish all labor, materials, equipment, and appliances, and perform all operations in connection with construction of all masonry walls of light weight concrete units, brick and other materials in strict accordance with the specifications and drawings, and subject to the terms and conditionsof the contract.

7-2. Building Brick:

(a) Furnish building brick in accordance with ASTM Designation: C62-50, Grade SW for walls against earth and Grade NW for back up.

7-3. Facing Stone:

(a) Facing stone shall be split face random ashlar native stone as produced in Russell County, Kansas, and commonly known as Denton Stone, color to be varigated.

(b) Submit samples of stone to State Architect for approval.

7-4. Lightweight Concrete Masonry Units:

(a) Lightweight concrete masonry units shall be made of Buildex, Haydite, or other lightweight aggregate approved by the Architect. Masonry units shall be Grade A quality at least equal to that required by Specifications for Hollow Load Bearing Concrete Masonry Units, ASTM Designation: C90-52 except that the maximum moisture content at the time of delivery shall be reduced to 30 per cent of the total absorption.

(b) Lightweight concrete masonry units shall be high pressure steam cured in autoclaves at 140 to 150 lbs. pressure at 360 degrees to 366 degrees F. temperature. Low pressure block shall be job cured a minimum of 30 days.

(c) Block sizes shall be modular in depth, height, and length having an actual dimension 3/8 inch less than the nominal dimension.

(d) Delivered units shall be protected from the soil and precipitation prior to use.

(e) Prior to acceptance, concrete masonry units shall be tested in accordance with ASTM Designation: C140-52. Sampling and testing will be at the expense of the General Contractor.

(f) The manufacturer shall furnish three copies of test reports and certify that concrete masonry units delivered to the project site will be manufactured, cured, and dried in the same or equally effective manner as were the samples on which acceptance was based.

(g) At the Architect's option, make an additional test of ten concrete masonry units, five for compressive strength and five for absorption.

7-5. Glazed Structural Tile:

(a) Furnish glazed structural tile units where scheduled on the drawings equal to "Arketex" units as manufactured by Arketex Ceramics Corporation, Brazil, Indiana or equal.

(b) Glazed structural tile units shall be approved and the color selected by the Architect.

7-6. Sand:

(a) Sand for masonry mortar shall be clean, sharp, washed river sand graded from coarse to fine with fine grains predominating. Gradation shall be as follows:

(1) For joints ½" or thicker, 100% of sand shall pass through #4 mesh sieve and no more than 10% to 30% through a #50 sieve.

(2) For joints of average thickness, such as brick, 100% of sand shall pass through #8 mesh sieve and no more than 15% to 35% through a #50 mesh sieve.

(3) For thin joints for units of cut or ground edges, 100% of sand shall pass through #16 mesh sieve and no more than 20% to 40% through a #50 mesh sieve.

7-7. Lime:

(a) Hydrated lime for masonry purposes shall conform to the requirements of ASTM Designation: C207-49 Type S.

(b) Quicklime for masonry purposes shall be pulverized to pass a #20 mesh sieve and conform to the requirements of ASTM Designation: C5-26.

7-8. Lime Putty:

(a) Lime putty shall be a stiff mixture of lime and water and kept moist until used. Putty made from pulverized quick lime shall be slacked until action has ceased, then add part or all of sand required and store for amminimum of 24 hours. Putty made from hydrated lime may be used immediately after mixing.

7-9. Waterproofing Admixture:

(a) Waterproofing admixture for masonry mortar shall be "Omicron" manufactured by Master Builder's Co., or "Hydratite Plus" manufactured by A. C. Horn Company.

(b) Mortar in all exterior masonry walls shall be waterproofed with one pound of admixture for each sack of cement and one pound of admixture for each cubic foot of lime putty.

7-10. Types of Mortar:

(a) Mortar for masonry walls below grade shall be 1 part Portland cement, 1/4 part lime putty and 3 parts sand by volume.

(b) Mortar for all other masonry work under this section shall be 1 part portland cement, 1 part lime putty and six parts sand by volume. Use non-staining cement for mortar in contact with cut stone.

(c) Incorporate waterproofing admixture in cement-lime mortar as are specified.

(d) Masonry cement shall conform to the current requirements of ASTM Designation C91 Type II.

7-11. Precautions:

(a) Do not lay masonry in freezing weather un ss s itable means are provided to heat materials, protect work m cold and frost and insure that mortar will harden without fr ing. No anti-freeze ingredient shall be used.

(b) Protect facing material against staining, and keep top of walls covered with non-staining waterproof coverings when work is not in progress. When work is resumed, top surface of work shall be cleaned of all loose mortar and, in drying weather, thoroughly wet. Brace walls as required to protect from injury.

(c) Brick having absorption rates more than 0.7 ounce per minute shall be wetted sufficiently so that the rate of absorption when laid does not exceed this amount. Structural tile having absorptions (1-hour boil) of 12% or more shall be wetted before laying. The units shall be wetted from 3 to 4 hours before they used; the method used shall be such as to insure that each unit is uniformly wetted. All units shall be free from water adhering to their surfaces when they are laid in the wall. Do not wet concrete masonry units.

7-11. Precautions:

(a) Do not lay masonry in freezing weather unless suitable means are provided to heat materials, protect work from cold and frost and insure that mortar will harden without freezing. No anti-freeze ingredient shall be used.

(b) Protect facing material against staining, and keep top of walls covered with non-staining waterproof coverings when work is not in progress. When work is resumed, top surface of work shall be cleaned of all loose mortar and, in drying weather, thoroughly wet. Brace walls as required to protect from injury.

(c) Structural tile having absorptions (1-hour boil) of12% or more shall be wetted before laying. The units shall be wetted from 3 to 4 hours before they are used; the method used shall be such as to insure that each unit is uniformly wetted. All units shall be free from water adhering to their surfaces when they are laid in the wall. Do not wet concrete masonry units.

7-12. Laying Concrete Units:

(a) All lightweight concrete masonry walls shall be true and plumb and built to the thickness shown on drawings. Wall shall be laid in straight uniform courses, with the units in the courses above regularly breaking joints with the courses below. Bond each course at corners and intersections of walls.

(b) Concractor shall provide and place such special units (precast lintels, corner block, door and window jamb block, fillers, veneer block, etc.) as may be required to form all corners, returns, and offsets using the required shapes and sizes to work to corners, and openings and maintain proper bond throughout the length of the wall.

(c) Reinforce every second horizontal joint in partitions and exterior block walls "Blok-Mesh" or "Dur-O-Wall" standard wall reinforcement.

(d) Bond room partitions to corridor partitions and exterior walls with galvanized metal anchors in every third horizontal joint. Fill in with brick where units cannot be used. Provide recesses for built in radiators and other items.

(e) Mortar joints shall not exceed $\frac{1}{2}$" thick with full mortar coverage on vertical and horizontal face shells. Vertical joints shall be shoved tight.

(f) In all rooms where the concrete masonry units form the finished surface of walls, care shall be exercised to obtain the neatest possible effect. All horizontal and vertical joints on finished surface of walls shall be tooled to give a slightly concave finish. Face of walls shall be kept clean of mortar. All brick size units appearing in interior face of wall and in partitions shall be of lightweight concrete.

(g) All lightweight concrete lintels shall be reinforced with one #4 reinforcing rod top and bottom for each 4 inches of width of the lintel.

(h) Bond and pattern of concrete masonry units shall be as detailed.

7-13. Built-In Work:

(a) Consult other trades in advance and make provisions for installation of their work in order to avoid cutting and patching. Build in work specified under other sections of the specifications and the work of other contractors as the work progresses.

(b) Set steel lintels in beds of mortar. Fill mortar around jambs and heads of metal door bucks and frame. Point around all sides of metal window frames with mortar. Fill joints behind jambs of wood window frames with mortar and caulk heads of frames with oakum. Leave space around outside perimeter of wood frames for plastic caulking.

(c) Build in all wooden nailing strips when necessary for wood finish. Strips shall not be continuous. Install anchor strips or blocks for plumbing fixtures as directed by the Plumbing Contractor.

7-14. Anchors and Wall Ties:

(a) Furnish and place special anchors, hangers, bolts, or rods as shown on the drawings or required in securing brick, stones or other materials together or to the backing. Where masonry walls occur against concrete work, including beams and columns, provide approved type dovetail slotted masonry anchors. Bond to be at approximately 14 inch centers vertically and 24 inch centers horizontally.

7-15. Recesses, Plumbing, Pipes, Conduits, Etc.:

(a) Leave recesses for plumbing, steam pipes, electric light or power conduits, cabinets, and other recesses necessary to complete the work, or required by other recesses necessary to complete the work, or required by other contractors.

(b) Close up any recesses after pipes are in and do all patching after other trades have completed their work.

(c) No plumbing, pipe, conduits, or ducts shall be enclosed until inspected by the superintendent. The Contractor shall take out any work that is built to the contrary and will replace it at his own expense.

7-16. Sample Walls:

(a) Prior to starting masonry work, build sample walls of brick to show required type of facing materials, range of color, and type and color of mortar joints. Approved wall samples shall be representative of proposed material method of laying and workmanship. Build wall approximately 4 by 5 feet.

7-17. Pointing and Cleaning:

(a) On completion, point up all exposed masonry, fill all holes and joints; remove loose mortar, cut out defective joints and re-point where necessary. Masonry surfaces to be exposed, either pointed or unpointed, shall be thoroughly cleaned. Do not use acid to clean glazed structural facing tile or face stone. Leave surfaces free from mortar and other stains at completion of work.

7-18. Vertical Joint Between New And Existing Walls:

(a) Furnish and install between old walls and new walls $\frac{1}{2}$" thick "Utlralite" glass fiber strips cut 1" less than width of wall. Utlralite to be as manufactured by Gustin-Bacon Co. Kansas City, Mo., or equal.

7-19. Glass Block Masonry:

(a) Furnish and install, where indicated by drawings, glass block units complete with all accessory items as recommended by Manufactures.

(b) Glass Blocks shall be as made by Owens-Illinois Co., Toledo, Ohio., #80GF 12" x 12" units. (Shade Green).

(c) All glass block shall be installed in strict accordance with Manufacturer's detailed specifications and as detailed on the drawings.

8 - DAMPPROOFING

8-1. Scope:

(a) Furnish all labor, materials, equipment and appliances, and perform all operations in connection with provisions of dampproofing, complete, in strict accordance with the specifications and the drawings.

8-2. General:

(a) All exterior concrete and masonry walls below grade and above the basement floor level shall be waterproofed by membrane method.

8-3. Materials:

(a) Membrane waterproofing shall be coal tar saturated fabric and coal tar pitch by Barrett, Kopper, or approved equal. Fabric shall weigh 11 to 15 oz. per sq. yd. and have a thread count of 18 to 36 per inch.

8-4. Workmanship:

(a) Waterproofing Contractor shall have had successful experience in the application of waterproofing and dampproofing and shall be approved by the manufacturer.

(b) Manufacturer's recommendations for application shall be followed.

8-5. Preparation of Surfaces:

(a) Remove fins and loose material from surface to be waterproofed or dampproofed. Fill wire holes and cracks with mortar and clean down before applying coatings. Surfaces must be dry when coatings are applied. Caulk with plastic cement around all pipe anchors and other items that penetrate waterproofing and dampproofing.

8-6. Membrane Waterproofing:

(a) All surfaces to be waterproofed shall be firm, smooth, dry and free from loose materials and coated with creosote oil at rate of one gallon per square. Cover with a membrane of continuous waterproofing consisting of two plies of saturated fabric and three moppings of Barrett or Royer's Waterproofing pitch.

(b) No less than 105# of waterproofing pitch, three moppings, shall be used for construction of each 100 sq. ft. of completed waterproofing and the pitch shall not be heated above 350°F. Lay fabric shingle method and lap end joints 12".

(c) The top of waterproofing shall extend up over brick shelf and behind brick masonry to grade line.

(d) Membrane waterproofing shall be protected until covered with a 1-inch coat of cement mortar as specified under Division 6.

8-7. Under Slab Waterproofing Membrane:

(a) In Room E301A in existing building. Furnish and install "Fabroid" or equal .010" waterproofing membrane as produced by Weatherguard Products Corporation New York 62, N. Y. complete with Necessary Fabroid adhesive; all installed in accordance with Manufacture's recommendations and as shown on the drawings.

8-8. Guarantee:

(a) All waterproofing shall be guaranteed by the General Contractor to be free from defects of materials and workmanship for a period of one (1) year from date of final acceptance of the building.

9 - STRUCTURAL STEEL

9-1. Scope:

(a) Furnish all labor, materials, equipment and appliances, and perform all operations in connection with provisions of structural steel, complete, in strict accordance with the specifications and the drawings, and subject to the terms and conditions of the contract.

9-2. General:

(a) All steel shall be designed, fabricated and erected in accordance with the specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings, as amended to date and the Code of Standard Practice, latest edition as adopted by the American Institute of Steel Construction, Inc., unless herein specified to the contrary.

(b) Welding shall be in accordance with the Standard Code of Arc and Gas Welding in building and construction of the American Welding Society.

(c) Anchor bolts and other incidental items of structural steel required to be built into concrete and masonry shall be furnished to respective trades, at proper time and shall include instructions for templates for their installation.

(d) Structural steel work shall include only those items called for and sized on the structural drawings.

9-3. Materials:

(a) Structural steel shall conform to the requirements of ASTM Designation: A7-53T, Steel for Bridges and Buildings. All rivet steel shall conform to the requirements of ASTM Designation: A141-52T for Structural Rivet Steel. The manufacturer shall make chemical and physical tests and furnish reports of tests to Architect.

9-4. Fabrication:

(a) All structural steel shall be fabricated as detailed and in accordance with the test practice in modern structural shops.

(b) Provisions shall be made in the fabrication of structural steel for the connections of other work including all necessary cutting, drilling, punching or tapping of the structural members, where shown on the drawings or where information is furnished prior to or at the time of approval of the shop drawings.

(c) The several pieces forming built-up sections shall be straight and fit close together; and finished members shall be free from twist, bends, or open joints.

(d) Bevels for field welds may be flame cut provided such cutting is not done manually. The bevels shall be as shown on the drawings and shall be free of burrs and slag.

(e) Corrective measures for errors in cutting, shop fabrication, or erection shall be approved by the Architect.

(f) Unless otherwise shown on the drawings, all field bolts shall be 3/4" and all open holes shall be 13/16". Steel bolts shall be furnished by the fabricator.

9-5. Handling of Materials:

(a) The loading, transportation, unloading and storing of structural steel shall be conducted so that the metal will be kept clean and free from injury.

9-6. Erection:

(a) All steel work shall be erected true and in its designed location. Members shall be plumb and level where so designed. Temporary bracing or shoring shall be installed wherever necessary to take care of loads to which the structure may be subjected, including erection of equipment, and the operation of same. Such bracing shall be left in place as long as may be required for safety.

(b) Welding rods for field connections shall be furnished by the steel erector.

(c) The Contractor shall do all cutting and fitting required to make all parts to fit accurately to their places in the building. Where necessary to cut into masonry or other parts of the building to set steel parts accurately, the Contractor shall do so in such a manner so as not to damage the adjoining parts and he shall repair such adjoining parts, thoroughly and neatly, where such cutting is done.

9-7. Shop Painting:

(a) All faying surfaces of steel, the surfaces within 4" of a field weld joint and all steel work to be encased in concrete shall be left unpainted. All other steel work shall be thoroughly cleaned and given a shop coat of Tnemec #99 red metal primer or approved equal.

9-8. Shop Drawings:

(a) The Contractor shall prepare and furnish to the Architect complete shop and erection drawings in accordance with Paragraph 15 of the General Conditions.

10 - MISCELLANEOUS METAL WORK

10-1. Scope:

(a) Furnish all labor, materials, equipment and appliance and perform all operations in connection with the provisions of miscellaneous metal work, complete, in strict accordance with the specifications and drawings, and subject to the terms and conditions of the contract.

10-2. General:

(a) The Contractor furnishing miscellaneous metal work shall carefully and thoroughly examine the drawings and specifications and to apprise himself of all items of work required under this section.

(b) Metal items specified under other divisions of the specifications are as follows: Anchors, bolts, sleeves, and supports required for installation of plumbing, heating, ventilation and electrical equipment; metal cramps, anchors, ties and dowels for stone, masonry and concrete; metal doors, compartments under Division 11, Metal Specialties.

(c) Miscellaneous metal work shall also include any structural steel that is called out and sized on the architectural drawings.

10-3. Materials:

(a) Cast iron shall be soft gray iron, true to pattern, smooth and straight and free from defects impairing strength and durability.

(b) Malleable iron shall be fully annealed and of uniform ductile structure throughout, forming high grade white iron castings.

(c) Steel shall conform to ASTM Designation: A7-53T for structural steel and ASTM Designation A27-52T for cast steel. Architectural and miscellaneous steel not otherwise indicated or specified shall be mild steel.

10-4. Workmanship:

(a) Steel and wrought iron shall be well formed to shape and size, with sharp lines or angles. Shearing and punching shall leave clean, true lines and surfaces. Weld or rivet permanent connections. Do not use screws or bolts where they can be avoided; where used, heads shall be countersunk, screwed up tight and threads nicked to prevent loosening. Curved work shall be evenly sprung.

(b) Castings shall be sound and free from warp, holes and other defects that impair their strength or appearance. Exposed surfaces shall have a smooth finish and sharp, well-defined lines and arrises. Machined joints, where required, shall be milled to a close fit. Provide necessary rabbets, lugs and brackets so that work can be assembled in neat and substantial manner.

(c) Fastenings shall be concealed where practicle. Thickness of metal and details of assembly and supports shall give ample strength and stiffness. Joints exposed to weather shall be formed to exclude water. Provide holes and connections for the work of other trades.

(d) At proper time, deliver and set in place items of metal work to be built into adjoining construction.

10-5. Building Iron:

(a) Provide all anchors, tie bolts, inserts, clip angles, etc., to anchor wood construction, doors, windows and other building items to concrete and masonry construction.

10-6. Steel Lintels:

(a) Furnish steel lintels for recessed heating units, cases, grille openings and other openings not shown on structural drawings.

(b) Provide 3 inch by $\frac{1}{4}$ inch steel plate lintels for electrical panel recesses detailed on Sheet #E-4.

(c) Furnish three 3-inch by 5/16 inch by 3' 2" long steel plate lintels for air relief vent grille openings in all rooms where mechanical work shows air relief vents.

10-7. Pipe Railing:

(a) Construct pipe railings as shown and detailed using "Braun" slip on steel or aluminum pipe and fittings as manufactured by J. C. Braun Co., 7540 McCormick Blud, Scokie, Illinois, or approved equal. Steel pipe shall be galvanized; aluminum shall be alloy 6063, satin finish. Pipe size shall be ($1\frac{1}{2}$") one and one-half inch I.P.S. for handrails, ($1\frac{1}{4}$") one and one-fourth inch I.P.S. for guard rails and balusters.

(b) Furnish all slip joints, connectors, brackets, flanges, sleevesinserts, etc., necessary to install railings complete and well anchored to building.

10-8. Painting and Protective Coating:

(a) All ferrous metal shall be properly cleaned and given one shop coat of Inemec #99, DuPont "Dulux" or approved equal metal primer. Galvanized metal shall not be shop primed, but all abraded places and weldings shall be touched up with aluminum paint. Galvanizing shall be done in accordance with the Standard Specifications of the American Hot Dip Galvanizers Association.

10-9. Shop Drawings:

(a) Before any fabrication is begun, shop drawings of all miscellaneous metal items shall be submitted to Architect for approval. The drawings shall show sizes of metal, method of assembly, hardware and anchorage or connection with other work.

10- 10. Cast Iron Frame and Cover:

(a) Provide cast iron frame and cover in dilution tank pits, similar and equal to McKinley #RL 30" x 30".

10-11. Cast Iron Catch Basin Frame and Cover:

(a) Provide cast iron frame and 30" x 30" Perforated cover in catch basin as indicated by the drawings. Similar and equal to Neenah #R-D1.

10-12. Metal Access doors:

(a) Furnish and install where indicated on floor plans Hohmann & Barnard Inc., 204 East 33rd Street, New York, N. Y. Type No. 702, 36" x 24" metal access doors.

10-13. Dove-Tail Slots, Ties, Inserts and Etc.,

(a) Furnish and install dove-tail anchor slots, anchors, ties and etc., where indicated by the drawings Hohmann & Barnard Inc., 204 East 33rd Street, New York, N. Y. "Eraydo Zinc" inserts.

(b) Furnish and install where directed by Laboratory Equipment Contractor-- Hohmann & Barnard #H12 hanger inserts to support hanger rods for blower platforms and kinred items.

11 - METAL SPECIALTIES

11-1. Scope:

(a) Furnish all labor, materials, equipment and appliances, and perform all operations in connection with provisions of metal specialties set forth in the following sub-division, complete in strict accordance with the specifications and the drawings and subject to the terms and conditions of the contract.

(b) The following metal specialties are included under the Division

A - Metal Doors Frame and Trim
B - Metal Toilet Compartments

A - METAL DOORS FRAME AND TRIM

11-2. General:

(a) Provide combination type, buck, frame, and integral trim where scheduled for doors and special interior openings formed to sizes and designs as shown, and fabricated from cold-rolled steel.

(b) All glazing will be done at the building by the glazing contractor as specified under Division 21.

(c) Aluminum entrances are specified under Division 21.

11-3. Combination Metal Bucks and Trim:

(a) Combination metal bucks and trim shall be fabricated from #14 gauge cold rolled steel. Miter and weld corners full length of joints and grind joints smooth. No screws or other fastenings shall be exposed unless from mechanical necessity. Bucks shown with flush or semi-flush trim shall have standard plaster flanges and grounds.

(b) Bucks shall be mortised, reinforced, drilled and tapped at factory to receive hardware. Reinforce frames so that door checks can be applied to either side. Provide cover boxes in back of all hardware cutouts. Punch frames and install Glynn-Johnson #64 rubber door sliencers, 3 on knob side of single doors and 2 in head of each double door leaf except double acting doors.

(c) Provide adjustable anchors of #14 gauge crimped or bent metal at least 2½" wide and 10" long on each side of frames; provide not less than 3 anchors on each side. Provide #12 gauge metal clip angle and cinch bolts for floor anchors; weld angle to bottom of each jamb member with provisions for vertical adjustment of buck. Where metal bucks abutt concrete columns provide special anchors to suit conditions.

(d) Before shipment install temporary spreaders at the bottom of each buck; remove spreader after bucks are secured in place. After fabrication clean all surfaces and apply filler and a prime coat of rust resisting paint.

(e) Install bucks plumb, rigid, and in true alignment; properly braced until built in. Secure door bucks to rough floor slab with two counter-sunk expansion devices at each jamb. Build in wall anchors as specified.

(f) Furnishes detailed all special metal frames on interior of building for observation windows and similar type openings.

11-4. Hollow Metal Doors:

(a) Flush type doors indicated as hollow metal shall be scheduled thickness, formed of #18 gauge cold rolled steel both sides and spot welded to reinforcement of approximately 2 3/4" centers both vertically and horizontally. Reinforce doors with formed steel sections extending full height of doors and spaced not over 6" apart. Tops and bottoms of doors shall have continuous stiffener channels welded to side plates. Insulate in each space between reinforcement with fiberboard or cork to deaden the metallic sound. Edges at top and sides shall be reinforced and finished flush.

(b) Mortise, reinforce and tap doors to receive hardware. Reinforcement shall be welded with the stiles and rails; reinforce top rails so that door checks can be applied on either side.

(c) Before assembly, prime all surfaces with a dip coat of rust-resisting paint and after assembly apply a filler coat and prim coat on exposed surfaces.

11-5. Shop Drawings:

(a) Submit shop drawings showing typical construction of all items in accordance with Paragraph 15 of the General Construction. For metal buck thicknesses and materials and a schedule listing the location in the building for each item.

B - METAL TOILET COMPARTMENTS

11-6. General:

(a) Provide toilet compartments is size, design, and arrangement as shown on the drawings. Compartments shall be top hung, flush metal type as manufactured by Sanymetal, Milwaukee Stamping Company, Weis, or approved equal.

11-7. Materials:

(a) Steel shall be cold rolled furniture steel, galvanized and bonderized with a smooth finish and of gauges specified. Manufacturer shall furnish "Certificate of Compliance" stating that all steel in doors and partitions has been galvanized and bonderized.

(b) Cores shall be of corrugated fiver board of such design and quality that will eliminate any metallic sound; use 6 plys for doors and panels and 7 plys for pilaster.

(c) Toilet compartments shall be similar and equal to Sanymetal's Normandie type.

11-8. Construction:

(a) Partitions and doors shall be of 1" thick and stiles and pilaster 1½" thick, flush construction, formed of 2 sheets of #16 gauge for stiles, #20 gauge steel for partitions and #22 gauge steel for doors cemented under pressure to corrugated core. Edges shall be interlocked under dension with #18 gauge bonding strips welded at corners. Reinforce doors and pilaster to receive hardware and reinforce pilaster to receive dividing partitions. All reinforcing shall be concealed. Anchor dividing partitions to pilaster by 3 concealed hooks holding partitions and pilaster together in tension grip.

(b) Anchor pilasters to ceiling carriers by means of jack screws leveling through a ½ by 7/8 inch reinforced cross bar made integral with pilaster. The top of the pilaster and ceiling connection shall be concealed by a 3 inch high brass chrome plated plinth.

(c) Hardware and stirrup brackets shall be attached with one-way headed screws.

11-9. Finish:

(a) All exposed surfaces other than hardware and pilaster trim shall be cleaned and given one coat of rust resisting primer baked on and followed by two coats of a high grade synthetic enamel to produce a semi-gloss finish of special color as selected by Architect. Each coat shall be separately baked on.

11-10. Hardware:

(a) All exposed hardware shall be heavy brass, polished chromium plated over nickel plate. Doors shall be equipped with controlled action hinge, having vertical pintle with ballbearing roller operating on adjustable cam to permit setting door position at angle desired. Working parts shall be concealed in door. Top pivot shall be recessed into edge of door and shall operate in non-friction bearing.

(b) Each door shall have one coat hook with rubber tip bumper, one slide bar or throw latch and one combination door stop and latch keeper. Each compartment shall have a paper holder for notched oval toilet tissue similar and equal to U. S. Sanitary Specialties No. 704.

11-11. Erection:

(a) Erect compartments rigid, straight, plumb and level. Secure partitions to wall with not less than 2 stirrups located near top and bottom. Each stirrup shall be through bolted to partition and bolted to wall with two bolts in expansion shields. Keep wall ends of partition panel away from wall approximately 3/4 inch.

(b) Anchor pilasters to ceiling carriers with leveling bolt and jack screw. Anchors shall be accessible for leveling and tightening and shall be concealed by a 3 inch polished stainless steel trim.

(c) All evidence of drilling, cutting, and fitting of wall, floor and ceiling finish, shall be concealed in finished work. Clearance at vertical edge of doors shall be uniform from top to bottom and shall not exceed $\frac{1}{2}$ inch. Carefully adjust hardware and leave in perfect working order. Finish surfaces shall be cleaned and left free from imperfections.

11-12. Shop Drawings:

(a) Submit to Architect for approval, shop drawings showing layout and details of construction of all conditions. Do not fabricate any work until shop drawings have been approved and colors selected.

12 - WINDOWS

12-1. Scope:

(a) This part of the work will include the furnishing, delivering and installing of windows as required by the drawings and schedules, each vent shall have hardware attached and each vent opening shall be screened, except where shown otherwise.

12-2. Materials:

(a) Windows will consist of Series 400DH and Series 500B-DH, as indicated by the drawings, all as manufactured by Cupples Products Corporation, 2650 South Hanley Ad., St. Louis 17, Missouri, or the equal thereto as approved by the Architect.

12-3. Specifications:

(a) Series 400 D.H. windows shall be double hung aluminum windows conforming to the Aluminum Window Manufacturers Association Specifications-D.H.-A2 dated 1957 with the following additions:

(1) White Bronze Hardware
(2) Stainless steel backed pile weatherstripping.
(3) $\frac{1}{2}$" glazing legs
(4) Interior extruded bead glazed.

(b) Series 500B-D.H. windows shall be double hung aluminum windows conforming to the Aluminum Window Manuacturers Association Specifications D.H.-A3 dated 1957 with the following additions:

(1) Minimum head and jamb sections .072"
(2) White bronze concealed locks.
(3) 5/8" glazing legs.
(4) Stainless steel backed pile weatherstripping.
(5) Interior extruded bead glazed
(6) Balance replacement without removing sash.

12-4. Erection and Installation:

(a) Windows shall be set plumb and true in openings, squared, securely wedged and held in alignment during construction. Contracts between windows and adjacent metal, including mullions, shall be sealed with elastic compound furnished and applied by the erector. Ventilators shall be carefully adjusted. All hardware as normally provided except where specifically stated to the contrary shall be included and attached so as to fully complete this part of the work. All fastenings, clips, and anchoring devices shall be provided for each window type.

12-5. Protection and Cleaning:

(a) The Contractor shall be responsible for protecting the windows during construction by means of ample coverings, and for the cleaning of them as directed by manufacturer, to protect all weather-stripping, and any damage shall be replaced at the expense of the Contractor.

13 - SHEET METALWORK

13-1. Scope:

(a) Furnish all labor, materials, equipment, and appliances and perform all operations in connection with the provisions of sheet metal work, complete in strict accordance with the specifications and drawings and subject to the terms and conditions of the contract.

13-2. General:

(a) The sheet metal work shall be installed at the proper time and as rapidly as the progress of the surrounding work warrants. Provision shall be made for the attachment of adjoining work, verifying all dimensions, sizes and similar information necessary for the proper installation. Sheet metal contractor shall do all cutting, drilling, tapping, and fitting required.

(b) Duct work, power exhaust fans, dampers and grilles for heating, ventilating, and air conditioning are included under Division 60. Fume hood exhaust and supply ventilators are included under Division 60.

13-3. Flashing:

(a) Flash at all points with copper where needed or shown as metal flashing to make a thoroughly waterproofed job. All flashing shall be with 16 oz. soft copper unless otherwise specified.

(b) Spandrel beam and sill flashing shall be 3 oz. Copper Armored Nasco or approved equal. Install flashing as detailed, within one inch of exterior face of wall, having joints lapped 4 inches and tightly sealed with mastic.

13-4. Metal Cap Flashing:

(a) Provide metal cap flashing of 16 oz. cold-rolled copper wherever base flashing is used and elsewhere as indicated on drawings.

(b) Form flashing in 8' 0" lengths except where shorter pieces are required and lap joints 4". Make flashing at angles continuous. Fold exposed bottom edge back $\frac{1}{2}$" on under side for stiffness and crease longitudinal at center of exposed surface just enough to product a spring action that will hold the bottom edges of flashing firmly against the base flashing. Make the cap flashing overlap base flashing 4".

(c) Cap flashing shall extend into walls not less than 4" in raked joints or in prepared masonry or stone reglets. Fasten flashing with wedges every 12" and fill reglet on vertical surfaces continuous with plastic cement and on horizontal surfaces continuous with molten lead.

13-5. Reglets:

(a) Provide reglets as detailed, formed from 16 oz. cold rolled copper.

13-6. Gravel Stop:

(a) Gravel stop shall be extruded aluminum, similar and equal to Alcoa Type "F", complete with all components, including welded mitered corners, joint covers, flashing and fasteners. Gravel stop shall be of sizes shown on drawings and shall be installed in accordance with manufacturer's instructions.

13-7. Canopy Drain Pipe:

(a) Provide 1½ inch I.D, brass drain spouts in front entrance canopy. Drain spouts shall be formed with 16 oz. copper flashing flange at roof and a #16 gauge brass escutcheon on the underside of canopy.

13-8. Gutters and Leaders:

(a) Furnish and install gutters and leaders for new work as shown by the drawings: gutters shall be formed from 16 oz. copper sized as detailed. Leaders shall be 3" x 4" formed from 16 oz. copper, corrugated. Secure each leader to wall with copper leader straps which conform, in character, to the existing building work. Space leaders about 8' 0" cc. Install bottom elbow at outlets.

(b) Where indicated by drawings, cut off existing leaders, and raise outlets to new required elevation. Furnish and install 16 oz. copper splash pans at outlets as directed by Architect.

13-9. Cutting and Patching:

(a) Where holes are cut through sheet metal or where patching is necessary, all is to be done in a neat manner and be soldered up tightly.

13-10. Shop Drawings:

(a) Submit shop drawings intriplicate to the architect as specified under general conditions. These drawings must cover the items called for under the sheet metal work, which require fabrication or approval.

13-11. Guarantee:

(a) All sheet metal flashing, etc., is to be made waterproof and shall be fully guaranteed against leaks for a period of two years from date of installation.

14 - ROOFING AND ROOF INSULATION

14-1. Scope:

(a) Furnish all labor, Materials, equipment, and appliances and perform all operations in connection with the provisions of roofing and roof insulation, complete, in strict accordance with the specifications and drawings and subject to the terms and conditions of the contract.

14-2. General:

(a) Consult sheet metal Division 13 of these specifications for details on application of metal flashing and cooperate closely with the sheet metal contractor as required for proper and workmanlike completion of roofing.

(b) Roof drains and inside conductors will be installed by the Plumbing Contractor under Division 50.

(c) Apply roof insulation to all roof areas. Contractor shall thoroughly clean all roof surfaces of dust, rubbish, etc., and shall satisfy himself of the proper conditions of all roof deck, curb, and cant surfaces before applying materials.

14-3. Roof Insulation:

(a) Furnish and install 1¼ inch thick Fiberglas roof insulation or 1½ inch square or offset edge fiberboard roof insulation on all roof areas. Fiberboard shall be treated against deterioration by fungi and shall be asphalt impregnated. Furnish pre-formed cant strips of same material as roof insulation, bedded in hot mastic, where required by drawings.

(b) On concrete decks apply suitable primer and mop insulation to roof deck with hot pitch or asphalt. Lay joints of board to moderate contact without forcing. Cut boards to fit neatly around projections through roof. Leave ½ inch joint between insulation and vertical surfaces.

(c) Build felt and bitumen water cut-offs by lapping insulation 4 inches on top and bottom; locate cut-offs at walls, eaves, cantstrips, within one foot of projections through roof, at end of day's work, and to isolate roof insulation into areas of approximate 30 feet in each direction. Keep insulation dry and after laying protect it against excessive foot traffic, wheelbarrows and gravel storage. Apply roofing material before end of each day's work.

14-4. Built-up Roofing:

(a) All flat roof areas indicated on drawings as built-up roofs shall receive gravel surface, tarred felt built-up roof equal to Barrett's Type "A-A" specifications for four-ply felt over roof insulation.

(b) Barrett, Johns-Manville, Kopper or other approved roofing manufacturers will be acceptable providing that they comply with the above specifications for pitch roofing.

(c) The roof deck shall be smooth, firm, free from all loose materials and shall be dry before roofing is applied. Roofing shall be laid by roofing contractor approved by the manufacturer and in accordance with directions of the manufacturer. Four-ply built-up roofing shall include the following minimum materials per 100 sq. ft. of roof surface:

Tarred felt, 4-plies 15 lbs.	60 lbs.
Pitch	200 lbs.
Gravel, 1/4" to 5/8" size	400 lbs.

(d) All felt base flashing for flat roof areas shown on drawings and required for a complete roof installation shall be equal to Barrett's Type "A-A" five-ply flashing and shall be installed by roofing contractor. The flashing shall include the following materials:

Five (5) layers of plastic cement
Four (4) plies of 15 lb. tarred felt
One (1) uniform coating of plastic cement
One (1) layer of 90 lb. mineral surfaced roofing.

(e) At parapets and walls, roofing felts shall be carried up the face of the cant and cut off at the wall. The flashing felts shall be applied over roof felts covering cant and carried up the face of the walls under metal cap flashing.

(f) Install pitch pockets where required.

14-5. Roofing Bond:

(a) The contractor shall furnish the owner with 20 year roofing bonds, guaranteeing the roofing and flashing against defects in materials and workmanship during that period.

(b) Bonds shall be by a reliable and acceptable security company.

14-6. Guarantee:

(a) In addition to the roofing bond all flashing and roofing installed under this contract shall be made waterproof and be fully guaranteed against leaks for a period of two years from date of installation.

15 - CARPENTRY

15-1. Scope:

(a) Furnish all labor and materials and perform all operations in connection with the provisions for carpentry, complete, in strict accordance with the specifications and drawings and subject to the terms and conditions of the contract.

15-2. General:

(a) Contractor for this section of the specifications shall do all the necessary work in his line as is usually required by other mechanics about the building, such as cutting away and rebuilding, fitting to other work, etc.

15-3. Wood Centers and Forms:

(a) Construct all wood forms and supports for reinforced concrete as specified under Division 5.

15-4. Grounds:

(a) All wood trim, unless otherwise shown, have wood grounds. In general, plaster grounds are to be 3/4" thick.

(b) Put up the necessary grounds for securing all finish throughout the building. Grounds to be secured to walls, same to be plumb and straight. Grounds fastened with plaster only will not be acceptable. Where impracticle to build in blocks, plug walls securely or use toggle bolts.

15-5. Scaffolds:

(a) Build and furnish all necessary scaffolds for proper progress of the work. These are to be safe and well constructed. At all times, furnish proper access, scaffolds, etc., for the purpose of the superintendent's inspection of the progressing work.

15-6. Rough Hardware:

(a) Furnish and install all nails, spikes, screws, bolts, anchors, ties and other accessories shown on the drawings, or as properly required to secure the woodwork.

15-7. Lumber:

(a) Unless otherwise specified all boards and dimension lumber not over 2 inch nominal thickness, incorporated in the structure, shall be Douglas Fir, "Construction" grade. Lumber shall be kiln-dried.

(b) Lumber for floor framing shall be Douglas Fir, "Select Structural" grade, Kiln-dried, finished 4 sides.

(c) Lumber delivered to the site shall be carefully piled off the ground in such a manner to insure proper drainage, ventilation and protection.

15-8. Plumbing Blocks:

(a) Provide all blocks or grounds for attaching lavatories, sinks, or other plumbing equipment and see that these are securely built into the walls and anchored.

15-9. Framing:

(a) The framing of roof curbs, fan grille openings, raised wood floor, and all other conditions requiring wood construction are to be framed as shown on the section, detail, and plans. All of this construction is to be solid and secure whether or not every part of timber is shown on the plans, and sufficient lumber is to be provided. Spike all timbers together securely at joints or splices and use bolts where shown or required to secure proper strength.

15-10. Preservative and Pressure Treatment:

(a) All wood blocking on roof, wood sleepers etc., shall be pressured with chromated zinc chloride to a final retention of 0.75 lb. of dry salts per cu. ft. of wood in accordance with American Wood Preservers' Association Specification or latest revision thereof. The lumber shall be kiln dried thereafter to a moisture content of 15% to 18%.

15-11. Raised Wood Floor:

(a) Construct raised wood floor in Room A313 and as detailed. Pressure treated wood sleepers shall be secured to concrete with power drive anchors.

(b) Sub-flooring shall be DFPA "Plybase" laid with face grain across joist with blocking under panel edges. Secure plywood to framing with 6 d common nails spaced 6" o.c. at panel edges and 10" o.c. at intermediate supports.

(c) Finish flooring shall be 25/32" x 3 1/4" tongue and groved vertical grain Douglas Fir kiln-dried grade A flooring laid over 15# asphalt saturated rag felt and nailed to sub-floor with 7d flooring nails 16" c.c. Provide 3" wide white oak nosing at leading edge of all platforms. Risers shall be faced with 3/4" thick plain sawed white oak. Wood base in Room A313 shall be 3/4" x 5 1/4" plain sawed white oak.

(d) All wood flooring shall be machine sanded after installation with approved sanding machines.

16 - MILLWORK AND FINISH CARPENTRY

16-1. Scope:

(a) Furnish all labor, materials, equipment, and appliances, and perform all operations in connection with provision of millwork and finish carpentry, complete, in strict accordance with the specifications and drawings and subject to the terms and conditions of the contract.

16-2. General:

(a) Stack lumber and plywood to insure proper ventilation and drainage. Protect lumber and plywood from the elements. Protect millwork and flooring against dampness during and after delivery. Store under cover in well ventilated building and where not exposed to extreme changes of temperature or humidity. Do not store or install millwork and flooring in any part of building until concrete, masonry and plaster is dry.

(b) All glazing shall be done at the building by the glazing contractor as specified under section on Glass and Glazing.

16-3. Grading Requirements:

(a) Moisture content: Not to exceed 18% for framing lumber and 12% for millwork.

(b) Grade and Trade Mark: Required on each piece of lumber (or bundle in bundled stock), use only the recognized official marks of association under whose rules it is graded. Grade and trade marks will not be required if each shipment is accompanied by certificate of inspection issued by Association.

(c) Quality: Lumber must be sound, thoroughly seasoned, well manufactured and free from warp that cannot be corrected in process of bridging or nailing. Woodwork exposed to view on outside of building or in finished interior spaces shall be dressed.

(d) Definition of White Pine: Where referred to herein, it shall include Northern White Pine, Western White Pine and Sugar Pine.

16-4. Grades and Species of Wood:

(a) Grades and species of lumber and millwork shall be as follows, except that grades and species herein after specified under specific items shall govern.

(1) All white pine specified under this section, including exterior and interior trim shall be B and better grade. Woodwork, not otherwise specified or noted on the drawings shall be white pine.

(2) All Douglas Fir plywood used on interior of building shall be interior A-B grade unless specified otherwise.

(3) All hardwoods, except flooring, shown on the schedule and specified in this section shall be plain sawed Grade "A" to conform to Commercial Standard #CS76-39. Hardwood required for this project will be white oak.

(b) Hardwood face veneers for plywoods shall be sliced plain white oak equal or exceeding best grade listed by U. S. Department of Commerce Commercial Standards CS-35-49 or latest revision thereof.

16-5. Interior Wood Doors:

(a) Interior wood doors shall be "Standard-Flush" first grade solid core of size, design and thickness indicated on drawings as manufactured by Hardwood Products Corp., Pain Lumber Company, U. S. Plywood Corp., or approved equal.

(b) Doors shall have cross banding and sliced plain white oak veneer. Vertical edges of doors shall be same species as face and 3/4 inch thick. Bottom rail of door shall be of sufficient width to permit one inch to be cut off bottom of door. Moisture content of veneer shall not exceed 5 percent.

(c) All doors so scheduled shall be furnished for glazing and with wood louvers as detailed. Stops and louvers shall be constructed of solid material of the same kind of wood as the face veneer.

(d) All doors are to be sanded down smoothly at the mill and hand sandpapered thoroughly after being installed.

(e) Doors must not be stored in damp warehouses or brought into the building until the plaster has thoroughly dried out. The manufacturer shall be responsible for the proper moisture content of the doors. Doors shall be guaranteed against checking, warping, twisting and such defects as would mar the appearance of the door. In approving doors, a warp or twist of $\frac{1}{4}$" or less will not be considered a defect.

16-6. Millwork and Trim:

(a) Exterior and interior millwork and trim shall conform to design and details shown. Kind of wood for millwork and trim shall be as specified under paragraph 16-4. Where practicle work shall be finished and assembled at mill. All millwork and trim shall be finished smooth with slightly rounded edges and free from machine or tool marks that will show through the finish. All nail heads shall be set to receive putty.

(b) All joints shall be tight and formed to conceal shrinkage. Shop miters 4" or more from heal to point shall be glued and locked. Make dowels and tenons to a driving fit. Make outside joints to exclude water and set in white lead past or waterproof glue. Make shop joints of interior work with waterproof glue under pressure.

(c) Door trim shall be in single lengths without splicing; corners shall be mitered. Running finish shall be in long lengths and joined only where solid fastenings can be made. End joints in built-up members shall be well distributed. Miter exterior corners and cope interior angles. Trim in existing building shall match old work.

(d) All cabinet work including display cases, reused cabinets, etc., shall be made complete and finished at the mill in sections of size that will allow for transportation and assembly together with bolts or as detailed and shall be well provided with cleats and blocking for protection while shipping.

(e) The cabinet work includes all rough and finished woodwork as shown on the drawings and as required for a complete and rigid installation. Cabinet work shall be specially and carefully constructed and finished by expert cabinet makers and shall have as much hand work done thereon as may be required to secure perfect results. Cabinet work shall not be brought into the building until the plastering is complete and thoroughly dried.

(f) The specifications under this paragraph shall apply to all millwork called out under special paragraph headings.

16-7. Display Cases:

(a) Furnish and install display cases in sizes and locations shown on floor plans and as detailed. Complete with shelf brackets. (Light fixtures and plate glass are specified under other Divisions of the Specifications.)

(b) Interior of cases shall have face veneer of sliced plain white oak. Build case to receive case front. Verify size.

(c) Furnish and install Knape & Vogt, Peerless Slotted Showcase Standards No. 148 and Brackets No. 180 for 14-inch wide shelf. Each case unit shall have two standards and four brackets.

16-8. Open Shelving:

(a) Open shelving designated by drawings shall be constructed as detailed. Lumber for open shelving work shall be S4S #2 B or better common White Pine, except where specifically shown otherwise on the drawings.

16-9. Shop Drawings:

(a) Submit shop drawings covering cabinet work items in accordance with Paragraph 15 of the General Conditions.

17 - CAULKING AND WEATHERSTRIPPING

17-1. Scope:

(a) Furnish all labor, materials, equipment and appliances and perform all operations in connection with the provisions of caulking and weatherstripping, complete in strict accordance with the specifications and drawings and subject to the terms and conditions of the contract.

17-2. General:

(a) See drawings and details for items requiring caulking. Completely seal with caulking compound joints around frames and sills of doors and other openings in exterior or interior masonry walls, and all other joints or spaces noted on drawings to be caulked or pointed with mastic.

17-3. Caulking Materials:

(a) Caulking compound for interior work shall be an elastic waterproof adhesive as manufactured by Tremco or Pecora. Compound shall be of proper consistency to be readily worked and not be affected by vibration or long exposure to outside climatic and temperature changes. Compound shall form a thin tough elastic film on surface but remain permanently plastic underneath; it shall contain no acid or ingredients which will stain stone, corrode metal or have an injurious effect on painting. Compound shall be white or colored as required to match adjacent work.

(b) All caulking for exterior work and expansion joints shall be a two (2) part polysulfide (Thiokol) - rubber based caulking and sealing compound, non sagging type as manufactured by the Churchill Chemical Company or approved equal.

(c) Thiokol based caulking sealants shall meet Federal Specifications SS-S-167.

(d) Rope yarn shall be raveled strands of non-staining rope fiber or cotton wicking.

(e) Caulking primer shall be a quick drying clear varnish thinned to proper consistency and of type recommended by manufacturer of compound.

17-4. Weatherstripping Materials:

(a) All exterior doors shall be weatherstripped.

(b) Door weatherstripping shall be similar and equal to Chamberlin No. 800-A spring bronze equipment, with hook type bottom strip. Apply weather-stripping with self tapping screws.

17-5. Caulking Application:

(a) Joints and spaces to be caulked shall be clean, free from dust, and dry. When gun consistency compound is used, prime stone and brick surfaces that

are in contact with caulking before caulking is applied. Joints more than 3/4 inches deep and joints where a suitable backstop has not been provided shall be packed with rope yarn to within 1/2 inch of surface, before applying caulking. Joints in stone and pre-cast work shall be filled slightly convex. Caulk joints before final coat of paint is applied to adjacent work.

(b) Apply compound with gun having proper size nozzle or with knife as required. Use sufficient pressure to fill all voids and joints solid; superficial pointing of joints with a skin bead will not be accepted. Remove excess caulking and leave surfaces neat, smooth and clean. Upon completion, caulking shall have a smooth even finish. All caulked joints shall be watertight.

17-6. Guarantee:

(a) All caulking and weatherstripping shall be guaranteed by the General Contractor to be free from defects of materials and workmanship for a period of one (1) year from date of final acceptance of the building.

18 - LATHING AND PLASTERING

18-1. Scope:

(a) Furnish all labor, materials, equipment and appliances, and perform all operations in connection with the provision of metal furring, lathing, and plastering, complete, in strict accordance with the specifications and drawings and subject to the terms and conditions of the contract.

18-2. General:

(a) There is a limited amount of plastering on the project including patch and repair work in the existing building.

(b) Special metal suspension systems for supporting acoustical tile are included under "Acoustical Treatment".

(c) When ceramic tile wainscots and or walls are required, the scratch coat back of ceramic tile will be specified under "Ceramic Tile".

(d) Work of other trades shall not be concealed by work of this Division until it has been inspected and accepted by the Architect.

18-3. Plaster Materials:

(a) Gypsum plaster shall be of standard quality conforming to ASTM Designation: C28-50 for gypsum plaster. On concrete surfaces use U. S. Gypsum Company's "Bondcrete" or approved equal. Keene's cement shall be used for the finish coat where so specified or scheduled. All Manufactured materials shall be delivered in the original packages, containers or bundles bearing the name of the manufacturer and brand. Hydrated lime must be at least 92% hydrated and conform to ASTM Designation: C206-49.

(b) Sand and Perlite plaster aggregates shall conform to ASTM Designation: C35-53T.

18-4. Metal Furring:

(a) Unless otherwise shown, metal furring shall consist of 3/4 inch channels spaced as required for type of lath used. Provide all furring, clips, crimped band irons, wiring and other attachments necessary to bring plaster to lines indicated.

(b) Fur around all pipes, metal, steel, and concrete beams as directed or shown on the drawings. All furring shall be assumed to extend from floor to ceiling or from wall to wall, unless otherwise shown or directed. All horizontal and vertical joints where stone masonry, brick or tile joins with concrete beams, columns, walls, etc., or between any dissimilar material, shall be covered with a 6" strip of metal lath.

(c) Fireproof furring around columns shall have 3/4 inch channels at approximately 24 inch vertical spacings. Where fireproofing extends away from column, install 3/4 inch channels vertical at corners and at not less than 16 inch spacing between corners.

18-5. Furring Channels:

(a) All furring channels to be cold-rolled painted stock. Runner channels shall be placed not to exceed 3'0" centers, and shall be not less than 1 1/2", weighing not less than 475 lbs. par 1,000 lineal feet.

(b) Furring channels shall be not less than 3/4", with a minimum weight of 300 lbs. per 1,000 lineal feet. They shall be erected at right angles to the runner channels and shall be securely tied to them by at least 3 strands of galvanized annealed wire, #17, at each crossing. Furring channels shall have a minimum of 12" c.c.

18-6. Metal Lath:

(a) All metal lath shall be flat diamond mesh lath painted black and weighing not less than 3.4 lbs. per square yard equal to U. S. Gypsum "Color Rite" red.

(b) Secure lath to metal supports and adjacent lath with #18 gauge galvanized annealed tie wire, or #12 gauge spring steel clips, galvanized or painted. Secure lath to masonry by nailing into joints with galvanized staples and secure to concrete by wire or other inserts placed in forms. Secure lath to horizontal wood supports with 1 1/2 inch long, #11 gauge roofer's nails with 7/16 inch head; secure lath to vertical wood supports with # 14 gauge wire staples, 4 penny common nails or 1 inch long roofing nails with 7/16 inch head.

(c) Lap flat expand lath 1/2 inch at sides and 1 inch at ends. Lap lath over chases and recesses 4 inches on all sides.

(d) Make and stagger end joints over supports or lace together between supports with tie wire. Secure side joints to supports. Space all other attachments for securing lath not more than 6 inches apart.

(e) Metal lath for ceilings in rooms where the masonry walls are to be plastered, shall be bent down on the masonry or side walls for a distance of at least 6".

(f) Metal lath shall be placed over all slots, chases and recesses in the walls not specified to be otherwise covered.

18-7. Accessories:

(a) All exposed horizontal and vertical plaster corners, except where otherwise detailed, are to have #1 Milcor expanded continuous corner beads, or equal by Penn Metal, Bostwick, or Wheeling. Where 3/4" radius bullnose expansion corner bead is detailed, furnish Milcor #10 or equal. Corner beads shall have 2 1/2" flanges, and are to be run to a straight line and be rigidly and securely fastened to the construction square with the corners, and plumb. Provide square ca ing beads where shown.

18-8. Mixing Procedure:

(a) Store all plaster at the site in a dry place, raised above the bare ground. Provide clean, watertight mixing boxes. Clean mixing boxes after each mix. Machine mixing is permitted providing machine is kept clean and free from set plaster.

(b) Tools shall be kept clean and shall not be rinsed in mixing water.

(c) Do not mix more material than can be applied in one hour, nor mix one batch with another. Plaster shall not be retempered after it has commenced to set.

(d) In hand-mixing gypsum plaster, sand shall be added at the job. Plaster and sand shall be mixed to a uniform color at one end of the box, hoed into water at the other end, and thoroughly mixed to proper consistency. In machine mixing, sand shall be added at the job and the following cycle shall be followed while mixer is in continuous operation.

a. Put in approximate amount of water,
b. Add approximately half of the sand,
c. Add all the plaster
d. Add remaining sand
e. Mix to proper consistency, adding water if necessary
f. Dump the entire batch and use.

18-9. Gypsum Sand Base Plaster:

(a) The scratch or first coat over all lath shall be mixed in the proportion of 1 part gypsum plaster to not more than 2 parts sand by weight (13 No. 2 shovels of damp sand per 100 lb. bag of plaster).

(b) The brown or second coat over all lath and the scratch and brown coat over masonry surfaces (except monolithic concrete) shall be mixed in proportions of 1 part gypsum plaster to not more than 3 parts sand by weight (20 No. 2 shovels of damp sand per 100 lb. bag of plaster).

(c) First apply a scratch coat, uniformly over lath and masonry, forcing the plaster well into the joints to form perfect keys. Thoroughly and deeply cross-rake the surface before setting.

(d) After the scratch coat is set firm and hard, but before it is dry, apply a second coat bringing it to a straight and even surface with rod and darby, ready to receive the finishing coat.

(e) Prepared gypsum sand-float finish (white) in scheduled rooms, shall be applied in two coats to a total thickness of not more than 1/8" over a set, half green, gypsum base coat. If base coat has dried out, it shall be sprayed, but not soaked, with water. Scratch in a thin coat and double back with a second coat, filling out to a true and even surface. Float with a suitable tool to a surface free from slick spots, cat faces, and other blemishes. Use water sparingly while floating.

(f) Sand float finish shall be mixed in the proportion of 50 lbs. of dry hydrated lime, 100 lbs. of Keene's cement and 400 lbs. of sand in lieu of prepared mixes.

18-10. Skim Coat:

(a) Skim coat plastered areas scheduled shall be finished with a skim coat of plaster similar and equal to U. S. G. Redtop cover coat finishing plaster.

(b) Mix skin coat material as directed by manufacturer and apply in one coat over properly prepared and dry concrete surfaces by scratching in a thin coat completely covering the concrete and then double back with a thin coat and levelling out the surface with light trowelling. When it has taken up, trowel with water to a smooth level surface. Total thickness not to exceed and average of 1/8".

18-11. Precautions:

(a) Maintain a minimum temperature of 50° F, in spaces to be plastered. Protect plaster from freezing and too rapid drying. After plaster has set hard, provide free circulation of air.

(b) Where plaster is applied direct to concrete surfaces without metal lath covering, clean concrete of all dust and loose particles by wire brushing, and of grease, oil or efflorescence by washing with a solution of 1 part muriatic acid to 10 parts water.

(c) Complete all plastering in rooms and spaces where acoustical treatment is required before acoustical material is installed. In rooms having terrazzo base and plaster walls, apply finish coat of plaster after terrazzo work has been completed. In rooms having ceramic tile or marble on walls, do not apply finish coat of plaster until tile and marble work has been completed. Before plastering is begun, see that tile, marble and terrazzo work is well protected with Kraft paper; joints lapped and sealed with tape.

18-12. Grounds:

(a) Proper grounds are to be provided for all plaster work and walls are to be kept true and straight. In case grounds are not found plumb and true in every respect, the plasterer will correct the defect and see that same are made straight before beginning the plastering. The plasterer will be held responsible for the work.

(b) All angles and corners must be plumb and straight and the plaster surfaces must be carefully rodded and darbied and finished perfectly straight and true.

18-13. Cleaning:

(a) Clean off all metal door frames, corner beads and windows or other metal or woodwork in a thorough and neat manner. Clean up all trash resulting from this work.

18-14. Scaffolding:

(a) Provide all scaffolding needed to carry on the work of lathing, furring and plastering.

19 - QUARRY TILE

19-1. Scope:

(a) Furnish all labor, materials, equipment and appliances, and perform all operations in connection with the provision of ceramic tile, complete, in strict accordance with the specifications and drawings and subject to the terms and conditions of the contract.

19-2. General:

(a) Before setting tile, furnish Architect with Tile Manufacturer's Association Standard Form of Master Grade Certificate signed by Contractor and manufacturer and stating grade, kind of tile, and identification marks for packages of tile delivered to job.

(b) Provide quarry tile window stools throughout building, except where noted or detailed otherwise.

(c) Quarry tile on floors and stairs shall be installed where scheduled and noted.

19-3. Quarry Tile:

(a) Quarry tile shall be standard grade, 1/2 inch thick with corrugated backs and shapes required. Color of tile to be selected by Architect. Sizes shall be 6 x 6 inches as noted on drawings. Stair tread nosings shall be 6 x 6 x 3/4" thick. All cutting and fitting shall be as job requires.

19-4. Setting Materials:

(a) Portland cement shall be waterproof type of Standard Manufacture, gray or white in color as required.

(b) Sand shall be sharp, washed clean, and uniformly graded from fine to coarse as follows: For pointing mortars, 100% passing No. 30 screen and not more than 5% passing No. 100 screen. For all other work 100% passing No. 4 screen and not more than 5% passing No. 100 screen.

19-5. Laying Out Work:

(a) Lay out tile on floors and lengthwise on walls so that no tile less than half size occurs. For height stated in feet and inches, maintain full courses to produce nearest attainable heights without cutting tile. Align joints in wall tile vertically and horizontally; no staggered joints permitted.

19-6. Tile Work:

(a) All tile shall be set in strict accordance with the "Tile Handbook" as compiled by Don Graf for Tile Contractor's Association of America. The portions applying to this project are hereby made a part of this specification.

(b) Quarry tile shall be carefully laid and bedded in not less than 1/2" setting bed with 3/8 minimum to 1/2" maximum joints. Butter back of quarry tile and fill grooves with neat cement. Setting bed shall be one part Portland Cement and three parts clean screened sand laid over the concrete base slab that has been cleaned wetted and given a scrubing coat of neat cement. Grout joints with Hydroment joint filler.

19-7. Protection:

(a) All tile shall be protected from damage during the progress of the work and until the completion of the building, and the Contractor shall furnish the necessary boarding to cover all projections, top surfaces, angles, etc.

19-8. Cleaning:

(a) Upon completion of the work, clean all tile work thoroughly. Any portions of the work that are stained so that they cannot be cleaned, must be removed and replaced with new material.

19-9. Guarantee:

(a) All parts of tile work to be fully guaranteed for a period of one year from date of acceptance not to come loose or come off under ordinary usage and any parts doing so, or being defective in any other way, due to poor materials or workmanship are to be replaced in a first class manner.

20- COMPOSITION FLOOR COVERING

20-1. Scope:

(a) Furnish all labor, materials, equipment and appliances, and perform all operation in connection with the provision of composition floor covering, complete, in strict accordance with the specifications and drawings and subject to the terms and conditions of the contracts.

20-2. General:

(a) Floor covering shall be vinyl-asbestos or vinyl tile as listed in finish schedules and herein specified.

(b) Submit samples of floor covering to Architect for approval. Colors will be selected by the Architect.

20-3. Vinyl-Asbestos Floor Tile:

(a) Vinyl-asbestos floor tile shall be 1/8 inch thick, 9 x 9 inch in size, similar and equal to Tile-Tex's "Flexachrome", and shall conform with or exceed the requirements of Interim Federal Specifications No. L-T-751 (GSA-SS) Type I (semi-flexible) floor covering.

20-4. Vinyl Floor Tile:

(a) Vinyl floor tile shall be 1/8 inch thick, 9 x 9 inch in size, similar and equal to Robbins' "Lifetime", and shall conform with or exceed the requirements of Interim Federal Specifications No. L-T-751 (GSA-SS) Type II (flexible) floor covering.

20-5. Adhesives:

(a) Adhesive for floor covering shall be waterproof type as recommended by tile manufacturer. Concrete floors on grade shall be primed with Federal Specification SS-A-701 or as recommended by the manufacturer.

20-6. Edging Strips:

(a) Edging strips shall be stainless steel or aluminum alloy of design to protect exposed edges of floor covering.

(b) Install edging strips where edge of floor covering is exposed. Fasten strips to floor with screws spaced 12 inches apart; use expansion shields or fiber plugs for securing screws in concrete.

20-7. Preparation of Sub-Floors:

(a) Remove grease, dirt and other substances, from sub-floors. Inspect floors for holes, cracks and smoothness; do not proceed with laying until sub-floors are smooth and holes and cracks filled.

(b) Maintain 70 degrees F. Minimum temperature in rooms for 24 Hours before and during time of laying tile and for 48 hours after laying. Stack tile in rooms at above temperature, 24 hours before laying.

20-8. Laying Tile:

(a) Lay tile in accordance with recommended specifications of the manufacturer; use only experienced workmen. Lay tile with joints tight and in true alignment. Lay tile to patterns indicated with grain reversed in alternate tile.

(b) Cut tile to fit accurately at joining with other material. Lay tile symmetrically about center lines of rooms or spaces with tile against walls not less than 6 inches wide. Tile against wall shall be same width on each side of room when possible.

(c) After floors have set sufficiently to become seated, wash with neutral cleaner and thoroughly buff. Upon completion, leave floors and base clean, smooth and free from buckles, cracks and projecting edges.

20-9. Guarantee:

(a) The Contractor shall provide a written guarantee against defects in workmanship and materials of floor covering for a period of one (1) year from date of acceptance.

21 - GLASS, GLAZING AND ALUMINUM ENTRANCES

21-1. Scope:

(a) Furnishing all labor, materials, equipment and appliances and perform all operations in connection with the specifications and the drawings and subject to the terms and conditions of the contract.

21-2. General:

(a) The sizes of glass indicated on drawing are approximate only and the actual sizes required shall be determined by measuring the frames to receive the glass.

(b) Glass of quality and kind as scheduled on the drawings and herein specified shall be Libby-Owens-Ford, Pittsburg Plate Glass, Mississippi Glass Company, or approved equal.

(c) All mirrors required for toilets and rest rooms shown on drawings are included under this Division.

21-3. Aluminum Entrances:

(a) Aluminum entrances shall be as manufactured by Brasco, American Art Metals Company, or Pittsburgh Plate Glass Company.

(b) All exposed metal parts of entrances shall be extruded of 6063-T5 aluminum alloy. All members shall be not less than 1/8 inch thick. Fabricate doors with through bolts in top and bottom rails plus concealed welds at each corner. All assembly and erection screws and fastenings shall be concealed.

(c) All exposed aluminum surfaces shall have a finish similar and equal to Alumilite 204R1 treatment with a minimum film thickness of 0.004 inch and a minimum coating weight of 17 milligrams per sq. in.

(d) Pairs of doors #1 shall be equipped with 3 pair butts, 2 Norton "D" or equal overhead closers with hold-open arm to swing-out, concealed panic hardware with cylinder lock and pull. Hardware shall be manufacturer's best quality and style as selected by Architect. All exterior doors shall be weather stripped. Locks shall receive master-keyed 1-5/32 cylinders furnished by hardware contractor.

(e) Entrances shall be installed under the direction of manufacturer's trained representative, by erectors approved by the manufacturer.

(f) Submit shop drawings showing typical construction of all items in accordance with Paragraph 15 of the General Conditions. Coordinate shop drawings with shop drawing for steel frame to anchor entrances in place.

21-4. Window Glass:

(a) All windows on exterior of new building except where noted otherwise shall be glazed with D. S. B. glass.

21-5. Plate Glass:

(a) Provide ¼inch thick, polished, glazing quality plate glass in scheduled doors, transoms, sidelights and other interior openings, cases, etc., not specified or noted on drawings as other kinds of glass. Exposed edges of glass shelves shall be ground and polished smooth.

21-6. Pattern Glass:

(a) Windows to toilet rooms shall be glazed with 1/8 inch Blue Ridge "Fine-Tex" or the equal.

21-7. Clear Wire Glass:

(a) Clear wire glass, polished plate, ¼ inch thick shall be "Nuweld" or "Misco". Use clear wire glass in schedule doors, including transoms and sidelights and other openings noted on drawings.

21-8. Mirrors:

(a) Furnish and install mirrors over lavatories in all toilet rooms as detailed.

(b) Mirrors shall be made of ¼" mirror quality plate glass. Mirror backs shall be silvered two coats, be heavily electro-plated with copper and given a prime coat of mirror-back paint.

(c) Mirror moulding shall be Kawneer #40-108 mirror snap-on aluminum moulding with Alumilite finish or approved equal.

21-9. Putty & Glazing:

(a) Glaze wood sash with putty consisting of pure linseed oil, pure whiting and at least 10% pure white lead.

(b) Glaze aluminum frames with glazing compound similar to that specified for steel sash, except that it shall be colored to match the aluminum and shall be guaranteed by the manufacturer not to dry out without painting.

(c) Glaze steel sash with glazing compound similar to Pecora #M-242 or Tremco "Tremglaze Mastic".

21-10. Manufacturer's Labels:

(a) Labels showing strength, grade, thickness, type and quality will be required on each piece of glass. Labels must remain on glass until it has been set and inspected. In addition to manufacturer's lables, wire glass must comply with requirements of the Underwriter's Laboratories. When glass is not cut to size by the manufacturer, and is furnished unlabeled from local stock, the Contractor shall submit an affidavit stating the quality, thickness, type, and manufacturer of the glass furnished.

21-11. Installation:

(a) Sash rabbets shall be thoroughly cleaned. Wood sash shall be galzed after priming.

(b) No glazing shall be carried on during inclement weather or when sash or glass are wet, damp, or frosted.

(c) All glass shall be bedded, back puttied, secured in place and, except where glazing beads are required, shall be faced puttied. Secure glass in exterior wood sash with zinc glazing points; secure glass in metal sash with spring clips, except where glazing beads are required. Apply putty uniformly, in straight lines, with accurately formed bevels and clean-cut corner; remove excess putty from glass. Secure glass in doors and interior sash with glasing beads.

(d) Glass shall not be forced into position and shall be shimmed at sill. Use full bed of glazing compound on all edges between glass and sash.

21-12. Cleaning:

(a) At the completion of his work, this Contractor shall clean all glass and mirrors and leave same in a perfectly clean condition to the entire satisfaction of the Architect.

22 - ACOUSTICAL TREATMENT

22-1. Scope:

(a) Furnish all labor, materials, and equipment, and perform all operations in connection with installation of acoustical treatment, complete, in strict accordance with the specifications and the drawings, and subject to the terms and conditions of the contract.

22-2. General:

(a) Refer to finish schedule and drawings for ceiling areas to receive acoustical treatment.

(b) Construct suspended acoustical ceilings to receive recessed light fixtures as required by fixture schedule. Refer to Mechanical drawings for location of ceiling grilles.

22-3. Acoustical Materials:

(a) Wood or cane fiber or glass fiber tile shall be of the random pattern perforated type, having a noise reduction coefficient of .65 for AMA mounting #7. This material shall be not less than 3/4 inches thick in 23 3/4"x 47 3/4" inch units. Tile shall be similar and equal to Simpson "Forestone" or Gustin-Bacon "G-B Ultrasonic."

(b) Acoustical tile shall meet the requirements of Federal Specifications SS-A-1186, Class "C" Slow Burning as tested and reported by the Acoustical Materials Association.

22-4. Mechanical Suspension System:

(a) Acoustical tile shall be installed on T-Bar Grid Type suspension system similar and equal to "Securitee Systems" line exposed type.

(b) Provide finish channel at wall with spring steel spacers. Hangers shall be #9 galvanized wire at not more than 4 foot centers each way. 1 1/2 inch channels shall be spaced at not more than 4 foot centers.

22-5. Installation of Acoustical Treatment:

(a) Acoustical treatment shall be installed by trained workers in accordance with manufacturer's recommendations. Tile shall be in a true and even plane, in straight line courses laid out symmetrically about center lines of ceiling or panel.

22-6. Samples:

(a) Submit samples of acoustical treatment and accessories to Architect for approval.

22-7. Cleaning:

(a) All acoustical treatment, upon completion or erection, shall be cleaned of soil marks in a manner and with materials recommended by the manufacturer. Damaged and misaligned tile shall be replaced.

22-8. Guarantee:

(a) All parts of acoustical treatment shall be fully guaranteed for a period of one (1) year from date of acceptance.

23 - FINISH HARDWARE

23-1. Scope:

(a) The Contractor shall receive, check, pay for, and apply all finish hardware selected by the Architect for the entire building in strict accordance with the specifications and drawings, and subject to the terms and conditions of the contract.

23-2. Hardware Allowance:

(a) The Contractor shall include the sum of $4,000.00 in the contract for finish hardware to be selected by the Architect. Should the hardware cost more than the above sum, the difference will be paid by the Owner, and should it cost less than this sum, the difference must be credited by the Contractor to the Owner, the credit to be deducted from the amount of the contract.

23-3. Application of Hardware:

(a) The Contractor shall receive, store, and be responsible for all finished hardware. Properly tag, index, and file all keys in key cabinet or as directed. Apply hardware in accordance with the manufacturer's instructions, fit accurately, apply securely and adjust carefully. Use care not to injure work while applying hardware. When necessary, remove and replace doors so that they may have bottom painted, and remove and replace hardware as required for painting of doors.

(b) Center door knobs 38" above floor and center door pulls and arm hooks 45" above floor. Cover knobs and pulls with heavy cloth until painting is completed. Prior to completion of building, examine all doors sash and other movable parts; adjust as required and leave hardware in good working order, free from defect.

24 - PAINTING AND DECORATING

24-1. Scope:

(a) Furnish all labor, materials, equipment and appliances, and perform all operations in connection with the provisions of painting and decorating complete, in strict accordance with the specifications and drawings, subject to the terms and conditions of the contract.

24-2. General:

(a) The Contractor shall examine the specifications for the various other trades and shall thoroughly familiarize himself with all their provisions regarding the painting, and he shall understand that all materials installed throughout the work which necessitate painting and which are left unfinished by the requirements of other specifications, shall be painted or decorated to completion under this contract.

(b) Field painting will not be required on items specified to be completely finished at factory or on aluminum, copper, brass, bronze, and other nonferrous metal unless specifically designated.

24-3. Materials:

(a) Paint, varnish, stains and fillers shall be of type and brands hereinafter specified. Painting materials such as linseed oil, shellac, turpentine, etc., shall be of highest quality, and have identifying labels on containers.

(b) All paint shall be delivered to site in manufacturer's sealed containers. Each container shall be labeled by the manufacturer; labels shall give manufacturer's name, type of paint, color of paint and instructions for reducing. Thinning shall be done only in accordance with directions of manufacturer. Job mixing or job tinting may be done when approved by the Architect.

(c) All paint must be approved by Architect. Furnish Architect with formula of paint to be approved and information to decipher code stamped in lid of containers. Proof of label switching or use of inferior painting materials will be sufficient cause for rejecting all painting on project.

(d) All materials for this work shall be of best quality as manufactured by Sherwin-Williams Company, Cook Paint andVarnish Company, DuPont, Pratt and Lambert, Pittsburgh Plate Glass Company, or other approved equal. DuPont's trade names are used in this specification for identifying quality and type of material.

24-4. Colors and Samples:

(a) Paint colors shall be as selected by the Architect. The Contractor shall then prepare samples at the job as required until the colors and textures are satisfactory.

24-5. Preparation of Surfaces:

(a) Sandpaper wood to smooth and even surface and then dust off. After priming or stain coat has been applied, thoroughly fill nail and other holes, and cracks with plastic wood or putty; for natural finished work, putty shall be colored to match the wood.

(b) Remove grease, rust scale and dust from steel and iron and touch up any chipped or abraded placed on items that have been shop coated. Where steel and iron has a heavy coating of scale, it shall be removed by wire brushing or sand blasting as necessary to produce a satisfactory surface for painting.

(c) Thoroughly clean all galvanized metal with gasoline and coat with DuPont "Dulux" galvanized metal primer (67-744) or a soution consisting of 4 ounces of copper sulphate in one gallon of water. Permit coating to remain on surface at least 12 hours, and dust off with stiff brushes.

(d) Fill all holes and cracks in plaster surfaces. Do not use sandpaper on plaster surfaces to be painted. Before painting any plaster, surfaces shall first be tested with a moisture testing device especially designed for this purpose. No paint or sealer shall be applied on plaster when the moisture content exceed 8% as determined by the testing device. Test sufficient areas in each space, and as often as necessary, to determine the proper moisture content for painting.

(e) Before painting, remove hardware, accessories, plates, lighting fixtures and similar items or provide ample protection of such items. Upon completion of each space, replace above items. When necessary, disconnect radiators to permit painting of walls behind them; replace and reconnect upon completion. Remove doors if necessary to paint bottom edge. Use only skilled mechanics for removing and connecting above items. Where painted signs or numerals are applied on glass doors, the glass shall be thoroughly cleaned with soap and water prior to painting.

24-6. Protection of Work:

(a) The painter shall be given the use of one room in a convenient location in the building, where he shall keep his materials, and do all mixing, etc. This work shall not be carried on in any other part of the building. The floor of paint room and every other place where painting is to be done shall be protected by drop clothes or suitable materials.

(b) Oily rags and waste shall be removed from the building at the close of every day, and under no circumstances shall they be allowed to accumulate.

(c) Painter shall be responsible for any damage done to the work of other contractors, and shall repair same to the satisfaction of the Architect. Where any work has been damaged to such an extent that it cannot be restored to the original condition, it shall be replaced.

(d) At the completion of the work the painter shall clean off all paint spots, oil and stain from all surfaces, and leave the entire building in perfect condition as far as his work is concerned. All containers and debris resulting from this work shall be removed from the premises.

24-7. Exterior Metal Work:

(a) All exterior metal work, except aluminum, not receiving a shop priming coat and shall be given a coat of DuPont "Dulux" Protective Primer (67-739).

(b) In addition to this priming coat, all exterior iron and steel work, unless otherwise specified, shall be painted two coats of DuPont "Dulux" 25-Line Metal Protective Topcoat.

24-8. Interior Metal Work:

(a) All interior metal door frames, casing, etc., will be primed at the factory. After all plaster work is finished, sand all rough and rusted areas to a smooth finish on all metal door frames, casings, window wall panels, etc., and apply one coat of DuPont "Ovalite" Enamel Undercoater and two coats of DuPont "Dulux" Super-White Eggshell, colored as scheduled or selected.

24-9. Wall and Ceiling Finish:

(a) All walls and ceilings in rooms scheduled for painting, including columns and beams shall be painted one coat of DuPont "Sealer Coater" Primer and under coater and two coats of "Dulux" Super-White Eggshell, tinted as directed and applied in the following manner:

(1) Prime Coat: Reduce Sealer Coater at rate of one pint of water to one gallon of paint. Tint with Nesco Vivid or other colors to desired shade.

(2) Intermediate and Finish Coats: Dulux Super-White Eggshell tinted with oil color to shade of color selected by Architect.

24-10. Interior Wood Finish (Natural):

(a) All interior oak finish including veneer doors shall be varnished as herein specified. Surfaces shall be sponged with cold water and sanded perfectly smooth when dry.

(b) All oak surfaces shall be finished natural color.

(c) First apply a thin wash coat of shellac.

(d) Second, fill open grain woods with wood filler tinted to match natural finish of oak. Reduce filler to brushing consistency with turpentine. Allow to set, wipe clean across grain of wood and allow for over-night drying.

(e) Third, apply a coat of clear floor and trim varnish, allow overnight for drying, and sand surface between coats with #00 sandpaper.

(f) Fourth, apply coat of satin finish floor and trim varnish.

(g) This work shall be done after all other mechanics are through with their work.

(h) All veneer doors shall have in addition to the varnish specified, a one foot strip of spar varnish on both faces applied at bottom of door.

(i) All interior Pinewood shelving, wood base, and wood flooring, etc., shall be finished as above for (c), (e), and (f).

24-11. Pipes, Covering and Radiators:

(a) All unfinished pipe and radiators, except Room A109 shall be painted by the Painting Contractor after all tests have been made by the Plumbing and Heating Contractor.

(b) All pipe without pipe covering and all radiation not primed at the factory shall be given one coat of iron primer equal to Sherwin-Williams "Ken-Kromix". All pipe covering will be primed with a heavy glue size having a fungacidal agent by the Plumbing and Heating Contractor.

(c) In addition to prime coats, all exposed pipe, pipe covering and radiation shall be given two coats of paint which shall match the color and type of wall paint in the various rooms. Pipe in crawl space, Room A109, and unoccupied spaces will be painted by others.

24-12. Application:

(a) Do not apply exterior paint in damp, rainy weather or until the surface has thoroughly dried from the effects of such weather. Do not apply varnish or paint when temperature is below 50 degrees F.

(b) Surface to be stained or painted shall be clean, dry, smooth and adequately protected from dampness. Each coat of paint shall be well brushed on, worked out evenly and allowed to dry at least 48 hours before subsequent coat is applied.

(c) Finished work shall be uniform, of approved color, smooth and free from runs, sags, defective brushing, clogging or excessive flooding. Make edges of paint adjoining other materials or colors sharp and clean, without overlapping.

(d) At completion, touch up and restore finish where damaged and leave in good condition. After fitting, give priming and body coats to all edges of wood insect screens. Paint top and bottom edges of metal covered and hollow metal doors one coat of varnish tops and bottoms of wood doors one coat after fitting.

24-13. Guarantee:

(a) Guarantee all paint, varnish and enamel to stay on and not blister or peel, or crack under ordinary usage. This guarantee shall hold good for six (6) months after completion and acceptance of the building. All defective work shall be replaced at the expense of the Contractor.

25 - MISCELLANEOUS EQUIPMENT

25-1. Scope:

(a) Furnish all labor, materials, equipment and appliances, and perform all operations in connection with provisions of miscellaneous equipment, complete in strict accordance with the specifications and the drawings and subject to the terms and conditions of the contract.

(b) The following miscellaneous equipment are included under this Division:

A - Chalkboards and Tackboards
B - Coat and Hat Racks
C - Fire Extinguishers and Cabinets
D - Special Window Shades
E - Kitchenette Unit
A - Chalkboards and Tackboards

25-2. General:

(a) Furnish and install chalkboards and tackboards in sizes, types, and locations as scheduled on Sheet 11, complete with aluminum trim as detailed.

25-3. Materials:

(a) Chalkboards indicated as Type "A" shall be "Durasteel No. 111" chalkboard, fired on 18 gauge enameling steel, as manufactured by Claridge Products & Equipment Corporation, Harrison, Arkansas, or approved equal. Enameled steel face shall be applied to ply-wood backing with sheet aluminum on reverse side. Color shall be as selected by Architect from standard colors.

(b) Type "B" chalkboard indicated shall be "Duracite" as manufactured by same as Claridge above, or approved equal. Glue 3/8 inch thick sheetrock to back of hardboard, as detailed to reinforce the chalkboard.

(c) Type "C" chalkboards shall be as detailed to slide up, chalkboards to be "Durasteel No. 111".

(d) As noted on schedule certain sections of chalkboard shall have permanent graph lines applied to the face of chalkboard to form one inch grid.

(e) Tackboard shall be $\frac{1}{4}$ inch thick natural color corkboard mounted on $\frac{1}{2}$ inch thick fiberboard.

(f) Aluminum framing with metal grounds for chalkboards and tackboards shall be as detailed and as manufactured by Claridge Products & Equipment Corporation, Harrison, Arkansas, or approved equal.

25-4. Chalkboard Comparison:

(a) If chalkboards of other manufacturers are submitted for approval, their equivalent quality to chalkboards specified will be determined in the following methods:

(1) That one is able to write on the chalkboards with red, orange, yellow, black and white chalk (chalk to be of aquality supplied by the American Crayon Company of Sandusky, Ohio) and produce legible marks equivalent to the marks produced on the specified chalkboards.

(2) That marks made with these colored chalks can be removed with dry cheese cloth as well as from the chalkboards specified.

(3) That the marks made with these colored chalks can be removed with a moistened cheese cloth as well as from the chalkboards specified.

(4) That the flatness of the chalkboard surface shall be such that chalk will mark with as smooth and solid a line as on the chalkboards specified.

25-5. Installation:

(a) Chalkboards and tackboards shall be installed by the manufacturer or its accredited representative. The wall backing shall be thoroughly dry.

25-6. Cleaning:

(a) Upon completion of installation of chalkboards they shall be properly "broken in", leaving the surface in perfect, ready-to-use condition.

25-7. Guarantee:

(a) The chalkboard installation shall be fully guaranteed for one year against defects in materials and faulty workmanship. The metal faced chalkboards shall be guaranteed for 20 years against defects in material. The 20 year guarantee extends to replacement of panel only and does not include the cost of removal and reinstallation.

B - Coat and Hat Rack

25-8. General:

(a) Furnish and install coat and hat racks as indicated by drawings, locations shown on floor plans.

25-9. Materials:

(a) Each rack shall be made up a 3' 2" long sections and 4' 2" long sections. Hat and coat racks shall be similar and equal to

Vogel-Peterson AW-3 and AW-4 "Wallmount" with two shelves and one row of hooks. Finish shall be baked on gray enamel.

25-10. Installation:

(a) Secure coat and hat racks to wall as recommended by the manufacturer.

C - Fire Extinguishers and Cabinets

25-11. General:

(a) Provide and install (8) eight recessed fire extinguisher cabinets, equipped with fire extinguishers in locations shown on the drawings.

25-12. Materials:

(a) Cabinets shall be #C-950 Elkhart, #285 Allenco, or approved equal, with inside dimensions 12" wide, 27" high and 8" deep, constructed of steel with plate glass door panel, and project trim as detailed on sheet.

(b) Fire extinguishers shall be 2½ gallon soda acid type and shall be labeled by the Underwriters' Laboratories. Extinguishers shall be charged and ready for use.

D - Special Window Shades

25-13. General:

(a) Im Rooms A125 and A313 (Lecture Rooms) furnish and install window darkening shades similar and equal to "Levolor" Heavy Duty Orange Line Audio Visual Venetian Blinds with motorized mechanical controls. Light seals at sides and bottom, and with 7" Cornice as Manufactured by Levolor Lorentzen Inc., 720 Monroe Street, Hoboken, New Jersey. These units shall be equipped with electric push button controls to mechanically and automatically adjust the lift, and tilt of the slats in the units. Units shall be for In-Between Jambs construction, provide dust cover assembled to top head channel as a light seal.

(b) In Rooms A303, A306, and A312 furnish and install window darkening shades for each window opening. These units shall be the same as specified under 25-13 (a) except that operation shall be performed manually with lift and tilt cords, and cornice shall 3⅛".

(c) For detailed specification of the above darkening shades refer to 1960 Sweets Catalog File--Section 19/LO.

(d) Workmanship and procedures shall be in accordance with the standards set forth by Levolor Lorentzen, Inc.

E - Kitchenette Unit

25-14. General:

(a) Furnish and install Kitchenette Unit equal to Dwyer model E-39-81-S electric kitchen unit 39" width x 81" high with 2 burners, electric refrigerator; sink with two valve swinging spout, basket strainer, 1 1/2" tailpiece and upper cabinet with light fixture. Entire unit shall be finished in porcelain on 14 gauge steel. Provide 1 1/2" 17 gauge bent tube adjustable chrome plated P trap with cleanout. Provide hot and cold water and waste connections.

(b) All plumbing connections will be made by the Plumbing Contractor. All electrical connections will be made by the Electrical Contractor.

26 - OIL HYDRAULIC ELEVATOR

26-1. Scope:

(a) Furnish all labor, materials, equipment and appliances and perform all operations in connection with the installation of an oil hydraulic elevator, complete, in strict accordance with the specifications and the drawings, and subject to the terms and conditions of the contract.

26-2. General:

(a) The installation shall be in accordance with any local codes which may govern the requirements of the installation. The work shall also comply with the requirements of the National Board of Fire Underwriters, The National Electric Code, and the American Standard Safety Code for Elevators.

(b) In all cases, where a device or part of the equipment is herein referred to as in the singular number, it is intended that such reference shall apply to as many such devices as are required to complete this installation.

26-3. Travel, Speed, Capacity, Etc.:

(a) Elevator shall travel from the ground floor to the third floor, a distance of approximately 22 feet, serving three landings with a total of three openings as shown on the drawings. The elevator shall have a capacity of 2,500 pounds exclusive of the weight of the car and shall travel at a speed of 75 feet per minute. Platform size shall be approximately 7' 6" postwise x 5' 0" front to back.

AVG. SPEED OF 75 FPM

26-4. Cylinder Hole:

(a) The Elevator Contractor shall provide the cylinder hole for the cylinder and the price shall be based upon known conditions at site. Rock excavation will not be encountered.

26-5. Operation-Automatic Push Button Self-Leveling:

(a) The elevator shall be operated by means of a push button station in the car and one at each landing entrance. The car panel shall contain a button for each floor served, a stop button, an alarm button, and a light switch, the momentary pressure of the proper button causing the car to travel to the desired floor. The car may be called to any floor by the momentary pressure of the button on that floor. A non-interference device shall render the outside buttons inoperative until the car passenger has had sufficient time to leave the elevator. All push button stations shall be of the flush mounted type, operated by key only.

(b) The elevator shall be equipped with an automatic self-leveling device to accurately bring the car to a stop at any landing with a variation of not more than one quarter inch from the sill level regardless of load. This leveling operation shall be accomplished by a gradual and smooth slow down in both directions of travel and shall prevent the car creeping away from the landing because of leakage or mechanical trouble.

26-6. Signals:

(a) Each corridor push button station shall contain a small round lamp fixture wired to the operating circuits to give a visual indication at all floors when the car is in motion.

26-7. Controller:

(a) The elevator controller shall be enclosed in a metal box with a hinged or screw cover and protected against dirt and dust. Each controller shall contain all required operating switches and relays of the full magnetic type, thermal overloads for the motor, fused protection for the operating circuits and all wires shall be brought to a terminal strip with each terminal being plainly marked to correspond to the wiring diagram. A print of the wiring diagram shall be attached to the inside of the cover plate.

26-8. Alarm Bell:

(a) An alarm button shall be furnished in the car station and connected through a suitable transformer to a four inch bell mounted in the hoistway or in location shown on plans.

26-9. Elevator Cab:

(a) The Elevator Contractor shall include in his bid an allowance of $1,200.00 to cover the furnishing of one passenger type cab. This allowance shall include the cab and accessory equipment, consisting of single speed car doors, fan fixture, light, and handrails. Submit designs of cabs and accessories for selection by the Architect. The allowance shall not include field labor for erection of the cab.

26-10. Car Doors:

(a) Each entrance to the car shall be provided with single type doors of flush design and finished in baked enamel to match the cab or or a color to be selected by the Purchaser. Each door shall be equipped with an electric contact which will prevent the elevator from being operated unless the doors are closed.

26-11. Car Light:

(a) The Elevator Contractor shall furnish a suitable light fixture in the car and connected to Underwriters' outlet to be furnished by others at center of hatchway. A light switch shall be incorporated in the car control station. A plug-in receptacle shall be provided on the bottom of the car and connected to a 110-120 volt supply.

26-12. Car Guides and Buffers:

(a) Guides for the car shall be 15 lb. planed steel tees.

(b) Two heavy spring buffers are to be provided and securely fastened in the pit at the proper height to protect the cylinder should the car, for any reason, run by the bottom limit switch. Buffer plates will be securely fastened to the bottom of the platform.

26-13. Car Guide Lubricators:

(a) Furnish and install two positive feed grease or oil lubricators to be mounted on the car guide shoes.

26-14. Platform:

(a) The platform shall consist of a welded fabricated steel frame with a pine sub-floor and top floor of tongue and grooved hardwood. The top floor shall be sanded, filled, and finished to receive a covering of rubber tile of a design to be selected by the Purchaser. The underside of the platform shall be fireproofed with steel sheets.

(b) The platform shall be mounted on rubber isolated pads of the proper size and density to effectively dampen out vibration.

26-15. Painting:

(a) All elevator equipment furnished in shop prime coat shall be given one finished coat of high grade enamel after installation and all equipment furnished in finish coat shall be touched up or repainted if scratched or marred during handling.

26-16. Pumping Unit:

(a) The pumping unit shall be a completely integrated assembly consisting of high torque motor, pump, storage tank, electric solenoid valves, relief valve, check valve, strainer, oil type air filter and "V" belt drive. A drip pan shall extend under the complete unit and isolated from the floor by means of oil resistant rubber pads or approved type isolation dampeners. A removable guard shall be provided on all sides of pumping unit. Power supply will be 208 volts, 3 phase, 60 cycle.

(b) A pumping unit will not be approved that is not in strict agreement with the equipment specified and does not incorporate the following features:

(1) A rotor or impulse type pump of quiet design.

(2) A device to automatically cushion the start of the car and smoothly accelerate to full speed.

(3) A device to prevent the car drifting away from any floor because of leakage or failure of a valve to close.

(4) An effective dampener that will absorb pump pulsations and prevent transmission of these vibrations to the car.

(5) A device that will smoothly deaccelerate the car in both directions as it approaches a floor stop and accurately level the car to the sill with a variation not to exceed one quarter inch. The slow down and leveling shall be accomplished in the direction of travel.

(6) Thermal overload protection for the pump motor.

26-17. Plunger Assembly:

(a) The plunger shall be fabricated from seamless steel tubing, turned and polished, with a stop plate welded to bottom to prevent plunger leaving the outside cylinder. The outside casing shall be of heavy duty pipe with one coat of rust inhibitor primer and one coat of black asphaltum. The cylinder head shall contain a babbitted bearing for the plunger and a non-adjustable sealed packing gland. The Contractor shall guarantee the packing and seal against oil leakage, replacement, or adjustment for a period of twelve months. Corrosive resistant jacketting shall be provided on jack cylinder.

26-18. Piping:

(a) The Elevator Contractor will furnish and install all necessary piping and fittings for proper connection of pumping unit to plunger assembly.

26-19. Oil:

(a) The Elevator Contractor will furnish suitable and necessary oil as the medium for operation of the elevator and shall attach a card to the pumping unit giving the specifications of the proper oil to be added when needed.

26-20. Hollow Metal Entrance:

(a) The Elevator Contractor shall furnish and install at a total of three openings, complete metal entrances, consisting of frames, doors, sills, facia plates, hardware, etc., in accordance with the following description.

26-21. Unit Frames:

(a) The unit frames shall be made of No. 14 U. S. gauge, best grade furniture steel and shall conform to details shown. The header shall be formed from 3/16" thick steel. The component members constituting the unit frame shall consist of header, strut angles, and frame of door opening.

26-22. Sills:

(a) The sills shall be feralun with approved non-slip wearing surface. They shall be a high quality casting of sufficient length to suit the two supporting struts.

26-23. Doors:

(a) Doors shall be of the single speed type, flush panel construction, in accordance with approved design, and to suit openings 3' 6" x 7' 0". The door panels shall be formed from not lighter than No. 18 U. S. gauge furniture steel, the two plates shall be separated by insulation of proper dimensions. Bottom of doors shall be provided with proper guides to run in sill slots with minimum clearance.

26-24. Casing:

(a) The casings shall be made of steel, and may be integral with the frame or applied to frame with concealed fastenings. Casing miters shall be neatly welded, and all miters ground perfectly smooth and even.

26-25. Hanger Covers and Facia Plates:

(a) Hanger covers shall be made of No. 14 U. S. gauge furniture steel, and shall be so constructed as to permit access for servicing hangers.

(b) The facia plates shall be made of No. 14 U. S. gauge steel and shall extend from top of hanger to sill above.

26-26. Finish:

(a) All structural parts shall be coated with rust inhibiting paint. Doors, frames, casings and other exposed parts shall be finished in solid color baked enamel.

26-27. Hangers:

(a) All doors shall be hung on sheave type ball bearing hangers of high quality construction with veritcal and lateral adjustment. The tracks shall be of hard cold drawn steel with proper brackets for fastening to the steel header.

26-28. Erection:

(a) Erection to be done by this Contractor. All work shall be set in perfect alignment with elevator car opening and platform. Frames and headers shall be fastened to structural supports which in turn shall be securely fastened to floor beams.

26-29. Car and Hoistway Door Operator:

(a) A motor driven electric operator shall be provided to open and close the car and hoistway doors simultaneously at any landing at a minimum speed of one foot per second. Door movement shall be cushioned or checked at both limits of travel. An electro-mechanical interlock shall be provided at each opening to prevent the operation of the elevator unless all doors are closed and locked. An electric contact shall be provided on the car door.

(b) The door operator shall be so arranged that, in case of interruption or failure of electric power from any cause, the doors can be readily operated by hands from within the car. Emergency devices and keys for opening the doors from any landing shall be provided as may be required by the local codes.

(c) The doors shall open automatically when the car is leveling at the respective landing and shall remain open as long as the car is parked. The momentary pressure of a car button or a landing button at one of the other floors shall cause the doors to close and when the interlock circuit is established, the car travel to the desired landing.

(d) The doors shall open automatically when the car is leveling at the respective landing, and shall again close after a predetermined time interval has elapsed. A "Door Open" button shall be provided in the car, momentary pressure of which shall reverse the motion, reopen the door and reset the time interval.

(e) The car door shall be provided with a safety edge extending the full height and projecting beyond the front edge of the door. This device shall be so arranged that should it touch a person or any obstruction in its path while the car door is closing, it shall automatically cause both the car door and the hoistway door to return to the open position. The doors shall remain open until the expiration of a time interval and then close automatically. The pressing of a car button, once the doors are fully open, shall cause the doors to close immediately.

26-30. Photo Electric Door Control:

(a) A light beam will be directed across the elevator entrance to a photo-electric door control unit, so that passengers entering or leaving the car will walk through the beam. Interruption of the light beam will recycle the door closing timer, causing the doors to remain open as long as the flow of traffic continues, and permitting them to close shortly after the last person passed through the door.

(b) If the doors are closing and the light beam is interrupted, and the doors will automatically reverse and return to their open position position, reclosing after a short time interval.

26-31. Work by Others:

(a) Extend electrical service from power main through a fused safety switch of ample capacity to the terminals of power controller. An outlet will be provided at center of car travel for a light on the car.

26-32. Guarantee and Service:

(a) The Elevator Contractor shall guarantee against faulty materials and workmanship and make good any defects not due to ordinary wear and tear, or improper use, which may develop within one (1) year from the date of completion of the building.

(b) The Elevator Contractor shall furnish maintenance service for a period of three months after completion and final acceptance of the elevator. This service shall include regular examinations of the installation during the regular working hours of the trade, and shall include all necessary adjustments, greasing, oiling, cleaning, supplies, and parts to keep this equipment in operation, except such parts made necessary by misuse, accidents, or negligence not caused by the Elevator Contractor.

27- Spray on Coatings

27-1. General Conditions:

The general conditions of the specifications covering the over-all project shall form an integral part of this section.

27-2. Extent of Work:

The work included in this section covers all labor, material, equipment and supervision necessary for the installation of Desco Vitro Glaze and Desco Vinyl Coatings by an approved franchised contractor, to all surfaces indicated by Room Finish Schedules shown on the drawings.

27-3. Materials and Workmanship:

(a) All materials shall be first-quality, freshly compounded and shall not include any bond coat materials or bonding agents which form a mechanical bond between the Portland Cement coatings and the wall surface. All materials used must be formulated in such a manner as to give a chemical bond with the wall surface, thus forming an integral part of the wall. The completed Desco Vitro Glaze must contain a minimum of 90% sand and cement with a maximum of 10% additives and glazing materials by weight. All installations shall be applied by technically trained factory approved mechanics, using mechanical equipment specifically designed for this purpose.

(b) All materials shall be first-quality, freshly compounded and formulated from pure vinyl resins. All installations shall be applied by technically trained factory approved mechanics, using mechanical equipment specifically designed for this purpose.

27-4. Preparation:

All surfaces intended to receive Desco Vitro Glaze or Vinyl Coatings shall be prepared by the general contractor as directed by this contractor and the Architect.

27-5. Application Procedure:

(a) Desco Vitro Glaze and Desco Vinyl Coatings shall be installed in a sequence of four operations on separate days as recommended in detailed specifications of the Manufactures.

27-6. Other Conditions:

(a) Sufficient time shall be allowed this contractor to complete the application of this work.

(b) The General Contractor shall provide sufficient electric power, light and heat at the application site to permit proper application of this product.

27-7. Color Selection:

(a) All color selection shall be made and approved by the Architect before this contractor proceeds with his work.

27-8. Guarantee:

(a) This contractor shall guarantee all coatings to stay on and not blister, or peel, or crack, under ordinary usage. This guarantee shall hold good for one year after completion and acceptance of the building. All defective work shall be replaced at the expense of the Contractor.

Laboratory Furniture and Equipment

30-1. General Note:

Requirements of "General Conditions of the Contract", forms a part of the following specifications and Contractors shall consult them in detail for instructions pertaining to the work.

Catalog numbers and names, and reference numbers and names used in the following specifications are those of Kewaunee Manufacturing Company, Adrian, Michigan. They are used to describe design, shape, size, services, and quality of the equipment and materials. They are not intended to be restrictive. First quality Products as manufactured by E. H. Sheldon Equipment Company, or Hamilton Equipment Company of equal quality as approved by the Architect are considered acceptable providing basic design and dimensions are maintained and equipment follows in detail the construction specification as set forth herein.

30-2. Scope of Work:

Furnish and install Laboratory Furniture and Equipment as shown on the drawings and as herein specified, complete with all fillers, panels and scribing strips necessary for a complete installation.

The following work is included in this contract.

(a) All plumbing service outlet fixtures mounted in and/or on the casework shall be furnished and shall be complete with tank nipples and lock nuts.

(b) All sinks, cup sinks and troughs shall be furnished and shall be complete with lead sink outlet assemblies, reversible stopper and traps.

(c) All electrical service outlet fixtures mounted in and/or on the casework shall be furnished and shall be complete with tank nipples and lock nuts.

(d) All blowers, cork insulated platforms, switches and bullseyes, and suspension systems. All ductwork, conduit and final connections shall be made by Mechanical and Electrical Contractors under other sections of the specifications and as more fully described by the drawings. All ductwork between blowers and fume hoods shall be connected as part of this work.

(e) All casework and cabinet work shall be delivered to the building, uncrated, placed in its proper location, assembled, leveled, secured where required to floors or walls, neatly scribed and fitted, and made ready for use.

30-3. Work by Others:

The following work will be done by others:

(a) All service connections, including hot water, cold water, waste and vent lines, gas, air and electricity will be brought to the fixtures and connected by the Mechanical and Electrical Contractors. Bottle rack pipe and conduit shall be furnished by the Casework Contractor terminating with a connector. All service lines from the point of rough-in (including cut-off valves) shall be furnished by the Mechanical and Electrical Contractors. Typical details are shown on the drawings which indicate the course of the service lines.

(b) All exhaust ductwork for fume hood blowers shall be furnished, installed and connected by the Mechanical Contractor.

(c) The General Contractor shall provide for all openings thru floors and walls for pipes and ducts as required by the equipment contractor but the equipment contractor shall furnish sleeves as he may require for his work and advise the General Contractor as the exact location of the sleeves. The General Contractor shall build in all inserts supplied to him by the equipment contractor providing the equipment contractor advises the general contractor as to the exact location of all inserts.

30-4. Samples:

(a) Any bidder shall submit, upon request, within a period of ten (10) days following the request, the following samples to demonstrate his ability to furnish the specified equipment in accordance with these specifications. Failure to submit these samples within the specified time provides good and sufficient grounds for rejection of the bid. Samples may be reduced in overall dimensions to facilitate shipping and display, but all component parts must have materials as specified, in full size thicknesses of materials and must show all construction as specified. Composite demonstration samples which do not show in their entirety bottom, end, back and top construction of case and cabinet as specified and as it is to be furnished, will not be acceptable under the sample requirements. Samples must show the construction throughout and must demonstrate material selection, workmanship and finish.

1. Top samples and finishes

2. Full height sliding door case sample

3. Full height swinging door case sample

4. Upper case or wall mounted swinging door case sample

5. Base unit sample showing a drawer above a single cupboard

6. Open leg table and apron corner section sample

30-5. Qualification of Contractor:

(a) All equipment included in this section shall be made by one manufacturer who shall be a specialist in the design and manufacture of scientific laboratory furniture equipment and who maintains adequate and experienced engineering and shop facilities to produce this equipment in the time required and in accordance with the requirements of this specification. If called upon, the manufacturer shall also furnish a list of plant facilities, engineering and shop forces, and proof of his financial ability to perform the contract. The manufacturer shall also furnish, upon request, a list of six (6) comparable installations which have been installed within the last year.

30-6. Drawings:

(a) Shop drawings shall be submitted in duplicate for approval prior to fabrication of the equipment. The contractor shall also furnish all necessary installation drawings including plumbing roughing-in drawings.

30-7. Guarantee:

(a) The contractor shall guarantee all materials and workmanship of equipment provided under this contract for a period of one year from date of final acceptance. Any defects due to improper materials or workmanship occuring within that time shall be promptly rectified by the contractor at his expense.

30-8. Woods Used:

(a) All woods shall be carefully and thoroughly air-dried before kiln drying and shall be kiln dried under control of the equipment manufacturer in his own modern properly humidified kilns to a moisture content of 4½%. All kiln dried lumber shall then be tempered to a moisture content of 6% before use. This moisture content shall be maintained throughout production.

30-9. Exposed Surfaces:

(a) All surfaces exposed after installation and including the interiors of open cases and cases having glazed doors shall be of Appalachian Oak or Northern Maple, or Northern Birch. The solid woods used for all surfaces exposed to view after completion of installation shall be clear and selected and matched for grain and color to the normally acceptable standards required of scientific laboratory furniture equipment. The finished installation must provide an attractive and harmonious appearance.

30-10. Materials:

(a) All woods used shall be kiln dried in the contractors own modern dry kilns under his complete control and supervision. All exposed woods shall be as described in 30-9. All plumbing service fixtures shall be laboratory grade red metal composition with copper content of at least 81% in a polished chrome finish with service identification on color coded plastic index buttons. All electrical receptacles shall be the grounded type and shall be in accordance with the requirements of the National Board of Fire Underwriters. Exterior hardware shall be of die cast metal alloy with a satin chrome finish. All hinges shall be of steel, five knuckle, institutional type with six screws per each hinge, hinges shall be finished satin chrome. Glass used in door construction shall be double strength and glass used in fume hoods shall be double strength safety glass. Sinks shown included with the laboratory furniture shall be of the material specified or molded high density resin.

30-11. Construction: Wood Base Units

(a) All casework and cabinet work shall be of the flush overlap type construction. All cases and cabinets shall be totally enclosed. Base units shall have full solid ends panels whether exposed or unexposed of 1/2" thick fir plywood with a solid oak front facing stile in a size of at least 3" wide x 3/4" thick. On all exposed ends an oak plywood panel shall be factory applied. Full horizontal hard wood frames shall be blind mortised and tenoned into the solid end panels the full depth of the units, the top horizontal frame shall be at least 1-1/4" thick and the bottom horizontal frame shall be at least 3/4" thick, being glued and screwed into the solid end panels under machine pressure. Intermediate horizontal frames shall be furnished between all drawers and cupboards and between all drawers in a minimum thickness of 3/4" being blind mortised and tenoned, glued and secured. 1/4" thick fir plywood backs shall be furnished on all base units whether cupboard, combination drawer and cupboard or solid drawer units. Backs shall be machined into the solid end panels. Heavy

glued corner blocks are to be furnished at the base of each base unit corner for reinforcement. All drawer heads and swinging doors are to be overlapped on all four sides for dust proofing. All drawers to operate on drawer keels with one keel provided on drawers up to 28" in width and two keels provided on drawers over 28" in width. All drawers are to be made removable with drawer stops furnished on all drawers. Removable backs must be supplied on all units requiring access to plumbing. Lock shelves must be provided between each and every drawer and between each drawer and cupboard whereever they are keyed differently. The space at all base units must be totally enclosed for dust and rodent proofing. Black rubber base molding is to be furnished at all case and cabinet work for cementing to bases and floor line for water and vermin seal. Swinging doors on base units shall be five ply with veneer face plies on both sides over hardwood crossband plies over hardwood edge banded hardwood core. Drawer bottoms and cupboard bottoms shall be of black tempered welded fiber.

30-12. Storage and Display Cases - Wood

(a) Storage and display cases shall have full solid end panels whether exposed or unexposed of 3/4" thick fir plywood with a solid oak front facing stile in a size of at least 3" wide x 1" thick, exposed ends shall have oak plywood panel factory applied. Top front rail and bottom front rail shall be blind mortised and tenoned into the solid front facing stile and shall utilize glue, screw and corner block construction. Plywood used in all swinging and sliding flush panel doors shall be 5 ply and shall be 13/16" thick in all sliding doors in cases 4 ft. or less in length and 1-1/16" thick in sliding doors in cases over 4 ft. long. Swinging doors shall be 13/16" thick in all lower or wall mounted cases and 1-1/16" thick in full height cases. 13/16" thick doors shall have a solid hardwood core with hardwood edge bands. 1-1/16" thick doors shall have a solid hardwood core with hardwood edge bands or hollow core with hardwood edge bands. All sliding doors are to be furnished with plastic glides at top and bottom of door which operate in plastic door tracks at top of case and plastic impregnated door tracks imbedded in extruded aluminum strip at bottom of case. Dust proofing strips are to be furnished at all sliding door cases at both end panel front facing stiles and between doors. All cases are to have backs recessed into the end panels from the rear with all backs reinforced by frames at the case rear. Exposed case backs shall be of 1/4" or 3/8" oak plywood and unexposed backs shall be of 1/4" or 3/8" fir plywood. Shelves in all cases shall be adjustable and removable.

30-13. Construction: Metal

(a) All Metal furniture required under the drawings and specifications shall be furnished in strict accordance with the description and details hereinafter provided. The metal furniture shall be rigidly constructed, and also shall be so assembled that it can be relocated at any subsequent time. The door and drawer heads shall be removable for purposes of decontamination and/or cleaning. Doors shall be readily removable, and hinges shall be easily replaceable. All hinges shall be applied to case and door bodies as hereinafter specified. Welding of hinges to either door or case will not be permissible. Where units are joined together

in assemblies, they shall be fastened by bolting through and uprights with 1/4-20 bolts. All cabinet parts shall not only be electrically welded, but also shall be notched, keyed and tightly fitted to form a mechanically constructed rigid unit. Any notching, piercing, bending, or framing not specifically called for in the following constructional specifications and /or on the drawings will not be permitted. All cabinets shall insure a smooth, cleanable interior on all base cabinets. The electro-welding shall comprise of spot-welding, arc-welding, and heliarc-welding. All support frames, curbs, and partitions shall be integrated into a complete assembly, as indicated on the drawings and/or specified.

The following minimum gauges of steel shall be employed:

Base Units

Intermediate vertical division uprights----------18ga.
Top horizontal front rails----------16ga.
Top and bottom horizontal rear rails----------18ga.
Intermediate horizontal front rails----------16ga.
Bottom front horizontal toe space rail----------18ga.
Corner gusset for leveling bolt----------12 ga.
End uprights----------18ga.
Cupboard bottoms----------20ga.
Drawer assembly----------20ga.
Drawer Channels----------14ga.
Door Assembly----------20ga.
Drawer case channels----------14ga.

Wall Hung Sliding Door Cases

Adjustable shelves----------20ga.
Paneled sliding doors----------16ga.
Glazed sliding doors----------18ga.
Soffit plate----------18ga.
End uprights----------18ga.
Case top----------18ga.
Case back----------18ga.
Case bottom----------18ga.

Wall Hung Swinging Door Cases

End uprights----------18ga.
Adjustable shelves----------20ga.
Glazed swinging doors----------18ga.
Paneled swinging doors----------20ga.
Case top----------18ga.
Case bottom----------18ga.
Case back----------18ga.
Soffit plate----------18ga.

Full Height Sliding Door Cases

Adjustable shelves----------20ga.
Corner guosets----------16ga.
Glazed sliding doors----------18ga.
Paneled sliding doors----------16ga.
End uprights----------18ga.

Full Height Sliding Door Cases Con't

Case top----------18ga.
Case bottom----------18ga.
Case back----------18ga.

Full Height Swinging Door Cases

Adjustable shelves----------20ga.
Swinging glased doors----------18ga.
Swinging paneled doors----------20ga.
Corner gussets----------16ga.
End uprights----------18ga.
Case top----------18ga.
Case bottom----------18ga.
Case back----------18ga.

30-14. Lead Drain Troughs

(a) Unless otherwise specifically called for, drain troughs shall be constructed of 3/4" hardwood lined with 6# to the sq. ft. chemical lead. Lead lining shall be carried over the top of the trough at sides and closed end and shall be returned under bottom and along sides of trough at discharge end to effectively prevent capillary action carrying water along underside of trough into furniture. All joints in lead shall be burned with a hydrogen flame and built up with a chemical lead. No solder shall be used at any point. Drain troughs shall have sufficient pitch toward discharge and to provide complete drainage. Troughs shall be rigidly supported and joint between trough and table top properly sealed with waterproof mastic sealer. Outer sides, closed end, and bottom of troughs shall be finished as specified under Finish.

30-15. Support Strut Assemblies

(a) Support strut assemblies shall be furnished in the plumbing space at rear of wall tables and at center tables for the purpose of properly supporting drain troughs, lead drain lines, and the otherwise unsupported overhang of table tops carrying hoods or other heavy equipment, and to provide the structural support for wall table or center table plumbing islands where called for. Support strut assemblies shall be provided on 4' centers or less, except that support struts, whose sole function is to support lead lined troughs, may be on not more than 5' centers. Each support strut assembly shall consist of two 16-gauge Kenstrut or Unistrut channel supports of the required length to allow adjustment for leveling. Two 1/8" x 1 1/2" strut spreaders, of proper length, shall be furnished to tie the channels together at top and bottom, through the use of four bolts and channel insert nuts at each spreader. Mechanical service piping may be carried on adjustable pipe hangers, supported on vertical member of support strut assembly. Drain line adjustable spreader supports of 1/8" x 1 1/2" steel, which bolt into vertical channels, will be provided with support strut assemblies where needed. Support strut assemblies shall be furnished with an acid, alkali and solvent resisting finish, as called for under Finish.

30-16. Locks:

(a) Locks shall be applied to doors and drawers where called for and shall be precision constructed of brass. Locks shall be 14 tumbler cylinder type. Lock face shall be chromium plated as specified. Keys shall be non-duplicatable for controlled replacements. All locks on instructors desks and storage cases shall be keyed alike and all student locks keyed differently. Locks shall be available in not less than a 7,000 key changes with 400 changes available under one (1) master key and 3,800 master key changes shall be available. Each department shall be under a separate master key if so desired. Two (2) brass keys shall be furnished with each lock.

30-17. Base Molding:

(a) Base molding shall be black chemical rubber, sufficiently plastic to permit cementing tightly against cabinet base and floor line to provide water seal. Molding shall be coved at bottom and shall be 2 1/2" high, and applied continuously around base of cases and cabinets after installation and levelling to cover any shims and to effect floor seal. Water proof cement shall be used as the adhesive and stainless steel corner guards shall be applied with screws at all corners.

30-18. Laboratory Water Fixtures:

(a) Laboratory water fixtures shall be 1/2" or 3/8" as indicated, and shall have renewable seats and washers. Handles shall be 4-arm handles, with plastic indicating button signifying by color and letters the service controlled, except on fixtures having quick acting valves, which shall have lever handles with service indicated by letter in the handle. Goosneck spouts, shall have a ten-serration hose connector.

30-19. Gas, Air, and Vacuum Cocks:

(a) Gas, Air, and Vacuum Cocks shall be specialized laboratory ground key type in 3/8" I.P.S. and shall have serrated hose nozzle integral with body of fixture. Each fixture shall have its plug and body individually lapped together to provide a ground joint which will be leak proof at 80 lbs. air pressure when tested under water. Handle shall be long enough and shall have cross section heavy enough to provide ease of operation and insure against bending and shall be attractively designed and comfortable to handle in use. Plug shall be positioned in seat of fitting by use of nut and thread on outside end of plug and a heavy spring shall be provided to insure leak-free seal. Plug shall be lubricated with a special sealing lubricant at seat. Serrated hose end shall have a long taper and ten serrations with a slender end allowing use of fixture with a variety of hose sizes.

30-20. Sinks:

(a) Unless otherwise noted in the equipment list shall be a modified epoxy resing bearing the trade name Durcon, as Recommended and manufactured by the Duriron Company, and shall be complete with lead plugs, strainers, tailpieces, and traps, or the equal as approved by the Architect.

30-21. Traps and Drain Fittings:

(a) Traps and drain fittings for science furniture shall be of chemical lead and shall be 1 1/2" diameter. All lead traps and drain fittings shall have lead-to-lead joints burned with pure hydrogen and no solder shall be used at any point. Traps shall have a deep drum bowl with a full diameter screw type cleanout plug at bottom of bowl. Each trap shall have an integral tailpiece of required length for connection.

30-22. Finishes and their Application for Wood:

(a) All work must be carefully prepared to receive finish. All wood surfaces must be thoroughly sanded for removal of any loose fiber, scratch marks, or abrasions, and after carefully sanding all dust must be completely removed with the use of a compressed air nozzle. Metal parts must be thoroughly degreased with a caustic degreaser.

(b) All finishes must be applied in a dust-free conditioned atmosphere and case work finishes shall be cured in a modern humidified oven at 140°F. and 30% relative humidity.

L. CASE AND CABINET EXPOSED EXTERIOR SURFACES (including tables, benches and apron sections)

(c) Case and cabinet exposed exterior surfaces, including interiors of glazed cases and open shelving, shall be finished in an acid, alkali, solvent, water and abrasion resistant finish. A wash coat of Polyvinyl Butyral Resin shall be applied, baked for 30 minutes, then sanded and carefully dusted with a tack rag. Mineral filler of proper color shall next be applied and carefully wiped across grain. Filler shall be baked for 90 minutes. Next apply a sealer coat which shall be baked for 30 minutes and then sanded and carefully dusted with tack rags. Next apply one coat of chemical resistant synthetic varnish which shall be applied and shall be baked for 50 minutes. The resultant finish shall provide a #60 Sheen semi-gloss finish.

LL. CASE AND CABINET INTERIOR UNEXPOSED SURFACES (including tables, benches, and apron sections)

(d) Interiors, except as otherwise specified, and unexposed exterior ends, backs, and tops of all case and cabinet work shall be finished with one double pass coat of tinted resinous wood sealer. Inside face of swinging door shall be finished as specified for exteriors. Drawer sides and drawer backs and meeting surfaces of upper and lower members of drawer keel shall have one coat of penetrating sealer and one heavy coat of tinted resinous wood sealer applied to all surfaces. All drawer and keel surfaces shall be carefully sanded, dusted, and waxed.

(e) Reagent shelving and reagent racks shall be finished in a black acid, alkali, and solvent resisting finish provided by three (3) coats of black synthetic resin sanded and carefully dusted between each coat with all 3 coats applied uniformly to all surfaces. The use of a chemical converting agent in the finish shall provide a hard, smooth medium gloss finish and shall meet the performance tests normally acceptable for the use intended.

(f) Lead lined wood troughs shall have unexposed bottoms, sides, and ends protected against moisture with one heavy coat of gray waterproofing aluminum finish.

30-23. Metal Case and Cabinet Finishes:

(a) After units have been completely welded together and before finishing they shall be given a prepaint treatment to provide excellent adhesion of the finish system to the metal and to aid in the prevention of corrosion. Complete cleaning of the metal shall be accomplished by immersion in a degreasing solution followed by immersion in a phosphate solution and a chromic acid solution to provide a complete non-metalic coating of complex iron-zinc phosphate.

(b) Following the phosphate treatment, the primer shall be applied and baked and sanded prior to the application of the enamel top coats.

(c) A standard epoxy resin base finish system consisting of epoxy resin primer and epoxy resin enamels is available in #32 gray, #33 gray, #43 gray and #44 green as standard colors. The epoxy resin finish system shall meet the following performance tests:

PERFORMANCE TEST FOR METAL CASE AND CABINET FINISH--STANDARD COLORS

Acids	Time in Minutes	Resistance Fair	Good	Excellent
Sulfuric, 85%	60		x	
Hydrochloric, 37%	60		x	
Phosphoric, 75%	60			x
Sulfuric, 25%	60			x
Nitric Acid, 25%	60			x
Glacial Acetic	60			x
Formic Acid, 88%	60		x	
Bases and Salts				
Sodium Hydroxide, 10%	60			x
Sodium Hydroxide, 25%	60			x
Ammonium Hydroxide 28%	60			x
Hydrogen Peroxide, 5%	60			x

PERFORMANCE TEST FOR METAL CASE AND CAPILLARY FINISH (CONT'D)

Solvents	Time in Minutes	Resistance Fair	Good	Excellent
Ethyl Alcohol	60			x
Ethyl Acetate	60			x
Ethyl Ether	60			x
Xylene	60			x
Acetone	60			x
Phenol, 85%	60			x
Formaldehyde, 37%	60			x
Carbon Tetrachloride	60			x

30-24. Tops - Impregnated Natural Stone Tops (Hemrock Shalstone)

(a) 1 1/4" thick science table tops and working surfaces, unless otherwise called for, shall be a natural quarried stone free of veins, laminations, and stratifications, and impregnated with a highly chemical and heat resistant resin resulting in a uniform ebony black finish. They shall be processed by impregnating the top throughout with a highly chemical resistant polymerizing resin solution. All surfaces are then sprayed with six 6 coats of the same resin and the top is baked for six (6) hours at 275° F, which results in a complete cure of impregnant and surface coating. The resultant impregnated natural stone top shall successfully meet the following performance tests: Composition or untreated natural stone will not be accepted as equal.

Acids	Surfaces Time in hours	Resistance Fair	Good	Excellent
Hydrochloric, 37%	24			x
Sulfuric, 96%	24		x	
Nitric, 70%	24		x	
Glacial Acetic	24			x
Sulfuric, 70%	24			x
Sulfuric, 25%	24			x
Nitric, 25%	24		x	
Phosphoric, 75%	24			x
Bases and Salts				
Sodium Hydroxide, 10%	24			x
Sodium Hydroxide, 25%	24			x
Ammonium Hydroxide, 29%	24			x
Calcium Hypochlorite, Saturated	24			x
Zinc Chloride, Saturated	24			x
Solvents				
Ethyl Alcohol	24			x
Ethyl Acetate	24			x
Ethyl Ether	24			x
Xylene	24			x
Acetone	24			x
Formaldehyde, 37%	24			x
Phenol, 85%	24			x

30-25. Stainless Steel:

(a) Stainless steel tops and working surfaces, where shown or called for, shall utilize Type 302 stainless steel unless otherwise specified, and all exposed surfaces shall be finished in a No. 4 satin finish. Tops shall be of 16 gauge stainless steel reinforced on the underside by 16 gauge carbon steel channels so spaced as to prevent twisting, oil-canning, or buckling. Exposed edges of top shall be formed into a channel shape 1 1/4" high and suitable wood inserts shall be provided on all four edges of underside of top to facilitate anchoring to base units. All edges shall have a raised rim 1" wide.

30-26. Impregnated Welded Fiber Tops (Kemweld, Greenweld or Grayweld)

(a) 1 1/4" thick impregnated welded fiber tops and working surfaces, where called for shall be 6 ply board consisting of 4 core plies of tempered pressed wood fiber sheets and 2 face plies of tempered pressed hardwood fiber sheets. The plies are laminated under temperature and pressure in a hot press with the use of Tego Phenolic Resin Glue as the bonding agent. Construction incorporating a plywood subtop with outer laminations or top lamination of impregnated welded fiber will not be acceptable. Impregnated welded fiber tops and working surfaces shall have a 1/4" wide x 3/16" deep drip groove around all exposed top edge and at exposed corners. Top must withstand the high baking temperature required to cure the 4 coat acid-alkali and solvent resistant finished.

30-27. Fume Hoods - Design

(a) Fume Hoods shall have double wall end panels with the front of the panel at the hood opening radiused providing a streamlined section, which will insure a smooth, even flow of air into the hood. The hood interior end panels shall be flush with the entrance shape to prevent eddy currents and back flow of air. The area between the double wall ends shall be closed to house the sash counter balance weights and such plumbing lines and remote control valves as are required.

(b) At the bottom of the hood opening shall be installed an air foil which shall present a streamlined appearance similar to the sides. This foil shall be mounted with a one inch open space between the foil and the bottom front edge of the hood, and shall direct an air stream across the working surface of the hood, preventing any back flow of air at the point. The air foil shall extend back under the sash so that the sash closes on top of the foil and, thus, cannot close the 1" opening.

(c) Hoods shall be equipped with an automatic air bypass at the top of the sash opening. The bypass shall limit the maximum air Velocity through the face of the hood and provide a relatively constant volume of air through the hood (regardless of sash position) when hood blowers are in operation. The hood bypass shall not be dependent on mechanical or electrical linkage, and shall be completely positive in operation.

(d) Hoods shall be equipped with a removable baffle at the rear of the hood, with adjustable openings at top and bottom, to allow the flow of air through the hood to be adjusted to compensate for type of gases, apparatus or heat source used in the hoods.

(e) The working surface of the hood shall have a raised ledge along the face of the hood to confine spillage away from the face of the hood.

(f) Where sash is specified, the hoods shall be equipped with a vertical sliding sash, glazed with 1/4" combination safety sheet. The glass shall be mounted in a continuous metal frame 2 1/2" wide, and set in a rubber channel. The sash shall be counterbalanced by means of lead weights which shall be connected to the sash with stainless steel cables operating over ball-bearing sheaves. Spring type counter-balances will not be acceptable. The sash frames shall be equipped on each side with plastic glides which shall operate in stainless steel sash guides to insure proper operation of the sash, and to prevent any metal to metal contact.

(g) Each hood shall be equipped with a cup sink, and with plumbing and electrical services as specified. Plumbing services shall be composed of remote controlled valves located within the end panels, and controlled by a handle projecting through the vertical facia panel of the hood and the rod supported by a 45° escutcheon plate. The valves shall be connected to a flange and hose connector located on the end panels within the hood. All exposed portions of the assembly shall be chrome plated and the handles shall be identified with index buttons of the proper color code.

(h) The hood shall be provided with a two tube fluorescent light of the longest practical length which shall be shielded from the hood interior by a 1/4" combination safety glass panel that is sealed into the hood body with rubber channels.

(i) Ductwork between Fume Hoods and Blower units shall be furnished with the hoods and shall be type 302 stainless steel #16 gauge.

CONSTRUCTION AND MATERIALS

Exterior of the hoods shall be constructed of cold rolled steel, and shall have the component parts screwed together to allow the removal of the end panels, front end facia pieces, top facia panel and air foil strips, to allow replacement due to damage or to afford access to the plumbing lines and fixtures. Spacers or reinforcements may be welded to these main parts. However, all welding shall be completed and the component parts bonderized and painted on both exterior and interior surfaces prior to assembly on the hood.

STAINLESS STEEL LINED HOODS

All surfaces exposed in the interior of the hood shall be type 302 stainless steel. The stainless steel, except the work

STAINLESS STEEL LINED HOODS CON'T

top, shall be 16 gauge with a #2B finish. The work top shall be 14 gauge stainless steel with a #4 satin finish. Glass used in the sash and for the fluorescent light shield shall be 1/4" combination safety glass. The sash shall be made with an 18 gauge stainless steel rolled shape 2 1/2" wide, with all corners mitered, welded and ground to make a complete stainless steel frame with no visible joints. The internal glass retaining strip shall be stainless steel, attached to the frame with stainless steel screws. The glass shall be sealed into the frame with a neoprene channel.

The baffle shall be removable to allow for cleaning and decontamination of the area behind the baffle, and shall be held in place with stainless steel screws. Stainless steel adjustment strips shall be provided at the top and bottom of the baffle, which are adjustable by the use of plastic knobs.

The working surface shall be made in the form of a watertight pan 1/2" deep, with a retaining ledge across the front edge. The surface shall be reinforced with a 1" steel grating, which shall be attached to the underside of the top with studs and retaining clips.

The entire stainless steel hood interior shall be reinforced with angles and plug-hats to provide a completely rigid assembly, welded together to form a self-supporting hood assembly to which the interior cold rolled steel parts can be screwed. A stainless steel duct flange shall be provided in the top of the hood in the plenum chamber in back of the top sloping baffle.

The hood facia panels, and the ends of hoods, shall be punched to receive four remote controlled service fixtures at each end of the hood. Holes not used for specified fixtures shall have removable plug buttons, which can be removed for later addition of service Fixtures.

TRANSITE HOODS

Hoods shall have interiors fabricated of Transite, as specified except that the work top shall be of Kemstone. No metal, except stainless steel, shall be exposed on the interior of hoods. The end panels, back panel, baffle and top shall be not less than 1/4" thick, and shall be screwed together with cleats or steel angles to form a completely rigid assembly to which the exterior cold rolled panels are mounted. All joints shall be backed up with angles or cleats to prevent open joints or spaces. The screws used to assemble the panels shall be stainless steel truss head screws, which are not counter-sunk in order to provide maximum strength to the screwed joints.

The sash shall be composed of an 18 gauge painted steel rolled shape 3/4" thick and 2 1/2" wide, which shall be mitered welded, and ground smooth to provide a complete frame with no visible joints. The glass shall be retained in the sash with a 1/4" Transite liner, which shall completely cover the inside of

TRANSITE HOODS CON'T

the sash frame and shall be held in place with stainless steel screws. The glass shall be sealed in the sash with a neoprene channel.

The hood baffle shall be screwed to cleats at the rear of the hood with stainless steel screws. Slots at top and bottom of the hood shall have adjustment strips which are adjustable by means of plastic knobs. A duct collar shall be provided at the top of the hood in the plenum chamber in back of the top sloping baffle. The working surface shall have a 1/2" thick raised edge across the front of the hood. The raised edge shall be bonded to the top to make a water-tight retaining ledge. The hood facia panels shall be punched to receive four remote controlled service fixtures at each end of the hood. Holes not used for specified fixtures shall be furnished with removable plug buttons.

PERFORMANCE

Airflow hoods shall give efficient operation, with an air velocity of 50 linear feet per minute through the face opening, when operating under normal laboratory conditions without the presence of cross drafts, high thermal loads, or other special conditions of this nature. Air velocity shall be uniform over the face of the hood. No reverse currents of air shall occur along the sides of the hood interior. The bypass shall control the maximum velocity of air through the face of the hood to 225 linear feet per minute, at any sash position, when the hood is operating at 50 linear feet per minute with sash open.

Each bidder, prior to award of contract, shall if so requested, demonstrate his hood performance to the buyer or his representative, in order to prove compliance to the specifications. This test shall be conducted with smoke tests and Airflow meters, and failure to meet specification requirements shall cause rejection of the bidder. Should bidder be unable to furnish hood to above exacting specifications and meet performance tests, he is directed to quote his "preasurized" or "air condition hoods" complete with make up air blowers in all rooms except in Room A-116 in which strict adherence to the specifications are required.

30-28. Equipment Schedule:

(a) Furnish and install the following equipment in the following rooms and located as indicated by drawings.

In Room A103

4 - Chemistry tables 15' long. Consisting of 5 #43 base cabinets each side all drawers with locks and numbers. Lead lined trough in center. Supported by struts and draining into #1015 Durcon Sink with metal support. Top to be of Kemrock or equal. Service to consist of the following mounted in Reacent Rock with Kemweld top: 5 cold water cocks, one cold water bibbcock, 10 gas cocks, 4 double-faced duplex 110 volt AC electrics.

In Room A103 Con't

2 - #2811187. 8' Air Flow fume hoods equipped with remote control services. 2 cold water, 2 gas, 2 air, 4 - 110 volt outlets, 2 tube florescent light fixtures with switch, and 3 way blower switch with warning lights. Cup sink, tail piece, and lead P-trap. Blower # 1 1/2 H with blower shelf and suspension system.

4 - #3346 balance table carrara glass tops with 3/4" Kemweld and 1/4" Felt. Each with case closures glazed on 4 sides and with counter-balanced sliding sash. Florescent lights mounted over the glass top with switch wiring and hook up by others.

1 - #3401 Instructors desk with Kemrock top. Services # 1003 Durcon sink, 2 cold water Goosenecks, 1 double gas cock, one Duplex 110 volt AC electric, 2 support rods with crossbar.

2 - #136 Glazed swinging door storage cases.

In Room A104

2 - #30 Base cabinets with Kemrock to P and 4" Back Splash, 29" x 5'9" with pedestal mounted 2 way gas and duplex 110.

1 - #2811147 4' Air Flow Fume hood with remote control air, gas, and cold water. Lead cup sink. #1 1/4 H Blower with Blower shelf and suspension system. Florescent light fixture with switch and 3 way blower switch with warning lights. 1 Duplex electrical 110 AC.

1 - #225 Wash-up sink assembly with #13 base unit one side #18 base other side. Top Kemrock with 4" back splash and 6" ledge. Services to be supported by struts and consisting of 2 double gas cocks, 2 duplex receptiacls, hot and cold water mixing faucet, Durcon sink.

2 - #113 Open wall shelving cabinets.

In Room A105

1 - #5W193 Darkroom developing table Kemrock with services as cataloged. 1 only #7140 base cabinet, 1 only #7079 with Kemrock top and ledge to match developing table. 1 additional 110 AC duplex with switch.

In Room A106 and 107

Each room to consist of the following assembly:

1 - #5W142 Wall Table. 1 only 7079, 1 only 7053. Top to be of Kemrock, 4" back splash with 5" ledge. Durcon sink. Hot and cold water, 1 double gas cock, 1 duplex 110 volt AC pedestal electric.

In Room A108

2 - #2S1316T 6' Airflow fume hoods each with remote control gas, water and air, two 110 Volt AC and two 220 Volt AC outlets. 2 tube floresecent light fixtures with switch. Blower switch with warning light. Cup sink. Blower shelf and Blower #1 1/2 H and suspension system.

2 - Center tables consisting of 8 #39 Base cabinets all drawers with numbers and locks, two #21 sink cabinets. Top Kemrock 54" x 14', 2 cold water #347 faucets, 6 #272 gas, 6 #272 air, 4 double faced pedestal duplex electrics. Each with two 110 V and two 220 volt outlets. #1006 Durcon Sink.

1 - Wall Table assembly consisting of 2 #7087 Sink Bases, 4 #7124 Base Cabinets, 2 #7122 Base Cabinets, 2 #1006 Durcon Sinks. 2 #350 Water Fixtures, 4 #286-2 air, 4 duplex recept, 1/2 220 and 1/2 110 V., top Kemrock 24" deep with 6" back splash and ledge services supported by struts and mounted in back splash.

1 - Wall table assembly consisting of 2 #7122 base cabinets, 2 #7140 and 1 #7087 sink base top Kemrock 24" with 6" back splash and 5" ledge, 1 #1006 Durcon sink. 1 #350 water fixture, 2 #286-2 Gas, 2 #286-2 Air, 2 Duplex Receptical, 1/2 110 V. and 1/2 220 V. mounted in back splash. All drawers with locks and numbers.

3 - #7507 Panel swinging door cases.

In Room A116

1 - Center table consisting of 4 #7166 Base cabinets, 2 #7087 sink cabinets, top to be of stainless steel, 14' x 48" with services deck mounted in corner and supported by Struts. 2 #1006 sinks. All drawers and cupboards with locks and numbers, 2 #350 water fixtures, 4 #272 gas, 4 #272 air, 4 double faced pedestal duplex electrics, 1/2 110 V. and 1/2 220 V.

1 - Wall table assembly consisting of 4 #7166 base units, Kemrock top, 6" B.S. with 5" ledge. Services mounted in B. S. 2 #286-2 gas, 2 #286-2 air, 4 duplex electrics, 1/2 110 V AC and 1/2 220 V AC.

1 - #2S1016 6' Air flow hood (Isotope) with remote control 2 gas, 2 air, 2 water, 4-110 V. AC and 2-220 V. AC, 2 tube floresecent light fixture with switch and blower switch with warning light. SS cup sink. Blower #4V mounted on shelf and suspension system. 1 #855 filter housing with 1 Prl. filter and 1 CWS type filter.

2 - Wall assembles consisting of 2 #7079 Base units with 6' Kemrock top and 4" B. S.

In Room A124

1 - Wall assembly consisting of 2 #7166 base cabinets, 1 #7087 base cabinet, top Kemrock with 6" BS and 5" shelf. Sink #1006, water #350, Lead plug, Strainer, tail piece and P. trap, 2 #286-2 gas, 2 #286-2 air, 2 Duplex Recpt., 1/2 110 V. AC and 1/2 220 V. AC.

In Room A125

1 - # 8359 Instructor's desk and services as cataloged.

In Room A205

1 - Preparation assembly to consist of 1 #7077 base, 1 #7087 base, 1 #7140 base, top Kemrock with 6" back splash and 5" shelf. 1 - #1006 Durcon sink, 1 -350 water, 1 #286-2 gas, 1 #286-2 Air.

In Room A207

4 - #8490 Geology center tables with two lead cup sinks, 2 #337 water fixtures, 4 #308 gas, 4 #308 air, Kemrock top.

1 - Wall assembly consisting of 4 #7537.

1 - Wall assembly consisting of #8336 wall storage with addition of one more open shelving and base unit in center. Length 15' 7 3/8".

1 - Wall table consisting of 3 #7122 base units Kemrock top and 4" B. S.

In Room A213

1 - #5W10 Instructor's desk and services as cataloged.

6 - Physics tables consisting of 2 #7180 base cabinets, back to back with top 48" x 6' Greenweld, 1 #1000 Durcon sink, 2 #273-2 combination gas and water 2 double face duplex pedestal recepticals 1/2 110 V. AC, 1/2 220 V. AC. apron to support top at overhang. 4 metal B. P. C. swing chair corner bracket attached with pogo stick. Locks and number on all drawers.

2 - Wall assembly #184.

In Room A215

1 - Preparation table same as specified for Room A205.

In Room A303

4 - #8484 (8 student) tables 14' x 4" long, 54" wide, 30" high, services as cataloged with addition of 4 double air cocks. Top Kemrock. All drawers with Locks and number Plates.

1 - 5W10 Instructor's desk as cataloged.

1 - #8332 Wall storage and display case assembly.

In Room A306

All equipment is to be identical to that specified in Room A303 except that two of the tables shall be #8484 student tables with six (6) student units 10' x 10" long with each student position having the same services as specified for Room A303.

In Room A304

1 - Preparation table same as specified for Room A205.

4 - #7547 Microscope Storage cases.

In Room A305

1 - Preparation table same as specified for Room A205.

In Room A310

1 - Only #8875 Wall table assembly with sink unit on right hand end.

In Room A312

4 - #8490x Student tables same as Room A207.

1 - #8338 Storage Assembly.

1 - #8336 Storage Assembly.

In Room A313

1 - #8359 Instructor's Desk as cataloged.

In Room E301C

3 - #8494 and services as cataloged.

1 - #5W10 Instructor's desk and services.. Kemrock Top.

4 - #7527 Full Height Storage Cases.

KEY CASE

Install as directed #9041 and #9042 Key Cases with ample capacity for each Room having Student Locking Drawers.

NUMBER PLATES

Install on each drawer and door of all equipment items listed above, having drawers or doors, one number plate and keyed lock marked so as to coincide with the number plates and Hang each key in the above mentioned key cases in exact sequence and position as directed by the Architect.

30-29. Seating:

In Room #A125

Furnish and Install a total of (150) One hundred and fifty tablet-arm pedestal chairs similar and equal to American Seating Company's #2508 "Varsity" Tablet-arm pedestal chair. Secure each chair solidly in place with base plates anchored to concrete floor as recommended by the Manufacturer.

40 - ELECTRICAL SPECIFICATIONS

40-1. General Conditions:

(a) General Conditions, Sheets 1 to 8 inclusive and Special Conditions of the Contract and Alternates, Sheets 2-1 to 2-13 inclusive are a part of this specification and shall be consulted as to detail.

40-2. Scope:

(a) Furnish all labor, materials, equipment and appliances and perform all operations in connection with the provisions of the electrical system complete and in strict accordance with the specifications and drawings and subject to the terms and conditions of the contract.

(b) Contractor shall visit the job site and the existing building. A submittal of bid proposal indicates the Contractor's knowledge of existing conditions and his acceptance of work required to protect, extend and revise existing structure which will be affected by this Contract.

40-3. General:

(a) This Contractor shall furnish all necessary labor, materials and equipment to provide a complete system of lights and power in this building to be known as Science Building, Additions and Alterations. The work includes the following items:

1. New power centers, transformers and secondary distribution.
2. Branch circuit panels and their feeders.
3. Branch circuit wiring, devices and outlets.
4. Special hazardous area wiring.
5. All wiring for plumbing, heating, air conditioning and ventilating equipment.
6. Outlets for telephones.
7. Lighting fixtures and lamps.
8. All other items required to provide a complete and workable system as indicated or as may be required.

(b) The electrical drawings include sheets No. E1 to E14.

40-4. Schedule of Materials and Equipment:

(a) The drawings indicates the extent and general arrangement of the electrical system. If any departures from the drawings are deemed necessary by the contractor, details of such departures and reasons, therefore, shall be submitted as soon as practicable to the state architect for approval. No departures shall be made without the prior written approval of the state architect.

(b) As soon as practicable, and within 30 days after the date of award of contract and before commencement of installation of any materials or equipment a complete schedule of materials and equipment shall be submitted for approval of the state architect. The schedule shall include catalogs, cuts, diagrams, drawings, and such other descriptive data as may be required by the state architect. In the event any items of material or equipment contained in the schedule fail to comply with the specification requirements, such items will be rejected.

40-5. Work to be Furnished by the General Contractor:

(a) Surround all electrical outlets with finish materials so that standard trim and wall plates will cover outlet openings.

(b) Furnish all plaster patching required for chases in existing walls.

(c) Provide openings and framing where necessary for recessed lighting fixtures.

(d) Provide furring around existing panels in Corridor A113 as indicated.

40-6. Codes, Permits and Inspections:

(a) All wiring shall be in accordance with the regulation of the latest edition of the National Electrical Code (NEC) in effect at the time of the work.

(b) All wiring shall comply with all applicable local, state and Utility Company rules, laws or ordinances.

(c) Secure and pay for all permits and inspections required for the installation of this electrical work.

40-7. Verifications:

(a) Verify all mounting heights and locations of electrical equipment before installation or roughing-in. Verify sizing and loading of equipment to be installed notifying the Architect in case of discrepancies or need for clarification. The outlets are shown as near the intended location as possible with small scale plans.

(b) Verify the exact location of electrical service entrance including point of service, system characteristics. Verify the exact location of service, notifying the Architect before installing service conduits.

40-8. Wiring Methods:

(a) The electrical contractor shall be held responsible for his fullest cooperation with other contractors on this project. He shall install his equipment in proper sequences so as not to interfere with or hinder the progress of other contractors.

(b) All materials shall be new and shall carry the Underwriter's Label or shall be "listed" by that group. They shall be fully equal to makes specified except where " no substitution" is noted.

(c) All wiring shall be with insulated copper conductors in conduit or approved raceways. Flexible conduit shall be used for connections to motors or similar equipment.

(d) All wiring shall be concealed with flush outlets. Chase new outlets in existing walls which are to be covered with finish materials. Certain wiring shall be exposed where indicated.

(e) Certain wiring shall be for hazardous areas with wiring as required by code. See the plans and following sections of these Specifications for exact requirements.

40-9. Demolition and Salvage:

(a) The Electrical Contractor shall remove all wiring and light fixtures as indicated or as may be required for the existing building areas which are being revised. Reuse certain lighting fixtures and maintain all branch circuit or power wiring which may be affected by this work.

(b) All lighting fixtures not reused shall be come the property of the Owner and shall be delivered to the Physical Plant Department warehouse as directed.

40-10. Tests:

(a) This contractor shall be responsible for performing all tests that are necessary to prevent the concealment of defective or improper work.

(b) Upon completion of his work, the contractor shall test the installation thoroughly and shall render it free from shorts, grounds, or improper connections.

40-11. Guarantee:

(a) This Contractor shall guarantee all materials and labor that are furnished and installed by him to be free of defects.

(b) All defective items of workmanship, materials, labor or mechanical operation developing within one year from the date of final acceptance of the completed installation shall be replaced to the complete satisfaction of the Owner.

40-12. Workmanship:

(a) Electrical equipment shall be installed in a neat and workmanlike manner.

(b) Unsightly installations shall be removed or reworked at no additional expense to the Owner.

40-13. Conduits:

(a) All conduit used in earth, below concrete on earth, in concrete, exposed to the weather, and for feeders and service entrance shall be rigid steel conduit, National Electric Products Corp. "Sheraduct" or approved equal. Electrical metallic tubing (National Electric's "X-Duct Junior" or approved equal) may be used for all dry interior runs, except in concrete. Fittings shall be used which are fully approved and in accordance with National Electrical Code. In no case shall EMT exceed 1¼" in size.

(b) Conduit shall be installed according to code requirements. This contractor shall be responsible for the protection of his conduits from damage or obstructions during construction. Conduits shall be sized in accordance with NEC tables except where specially sized on the drawings.

(c) This contractor shall be allowed the privilege of rerouting conduits where such action does not adversely affect the intended design or circuiting. Conduits shall be run beneath concrete slabs on fill. Conduits in structural slabs shall be installed over reinforcing materials so that conduits are completely concealed.

(d) Concealed conduits shall be run in a direct line and with as long bends as possible. Exposed conduit shall be run parallel to or at right angles to the lines of the building.

(e) All exposed conduit and boxes shall be rigidly supported with straps and toggle bolts, tamp-ins or wood screws as the case may be.

40-14. Conductors:

(a) Conductors shall be copper with 600 volt rated insulation except primary transformer wiring which shall be rated 5 KV.

(b) Branch circuit wiring shall have a minimum size of #12 and shall be type "TW" or as required. Panel feeders shall be type RHW or as indicated. Fixture wiring shall be type AF, AVA or TA as required. Low voltage wire shall be type TF or TFF in #18 gauge unless noted otherwise.

(c) Primary conductors from oil cutouts to transformers shall be 5KV General Electric Super Corn 1 Geoprene Shielded No. S1-58042 or approved equal in conduit. Conductors shall be sized as shown.

40-15. Joints and Connections:

(a) All 600 volt or less conductor connection to service equipment and panels shall be made with bronze solderless lugs. Joints and splices shall be made mechanically tight by pressure type conductors or by soldering for conductors smaller than #8 gauge or larger use bronze split connections.

(b) No joints or connections shall be pulled into conduit or ducts. Joints and splices shall be insulated with Okonite rubber tape and friction tape or with Scotch #33 plastic tape.

(c) Each shielded conductor (5 KV primaries) shall terminate at switches and transformers in stress cones properly constructed in accordance with the cable manufacturers recommendations. Conductor shield shall be grounded and shielding shall be carried across each joint. No joints will be allowed in underground cable and any joint in 5 KV cable must have the written approval of the state architect.

40-16. Outlet Boxes:

(a) Outlet boxes shall be galvanized steel of a type and size approved for the particular installation requirements.

(b) In new construction, generally, the 4" square outlet box with 1½" plaster ring; (Richards No. 52-C-50 single gang or No. 52-C-53 double gang) shall be used for masonry wall outlets. In masonry walls where single outlets have conduit entering from below and/or above, 3½" deep sectional switch or handy boxes may be used.

(c) 4" square boxes with suitable plaster ring flush with finished materials shall be used in stud or concrete walls.

(d) Standard octagon boxes shall be used for ceiling light outlets (non-hazardous areas) unless special depth boxes are required to allow for reinforcing steel. Ceiling outlets shall be equipped with suitable plaster rings where installed in plaster ceiling or where required.

(e) All boxes shall be firmly fastened to the building construction and they (or their plaster rings) shall be flush with finish materials. Where practicable conduit shall be offset close to outlet boxes so that conduit is near center of wall.

(f) Junction or pull boxes shall have flat steel covers or if in finished rooms blank plates as specified.

(g) All outlet boxes and rigid conduit connections shall have double locknut and bushing.

40-17. Cleaning Outlets:

(a) The electrical contractor shall clean all outlets of plaster, mortar, etc. immediately after such construction work in that vicinity is completed. He shall clean such debris to the limits of the outlet.

(b) This contractor shall notify the general contractor of any outlets which require patching so that standard trim will cover rough opening.

(c) All wires shall be pulled and joints shall be soldered and taped before finish coats of paint are applied or acoustical board ceilings are installed.

40-18. Wall Switches:

(a) Line voltage wall switches shall be flush mechanically operated with brown handles. They shall be single pole, double pole, three way, four way or other types as indicated on the drawings.

(b) Wall switches shall be Hart & Hegeman Junior "Quiette" switch series Q, rated 15 amperes at 120 volt or approved equal. Switches shall not be loaded greater than 80% of the raged capacity. Where interchangeable switches are indicated use Hart & Hegeman "Quiette" series QU, rated 15 amperes at 120 volt or approved equal.

(c) Thermal-overload switches shall be equal to Square D or approved equal type AO. or type AF if required with pilot light. They shall be equipped with thermal heaters of approximately 125% of the full load current of the motor or items to be protected. They shall be flush type with conventional plates, or where surface work is approved they shall be in suitable enclosures.

(d) Special switches other than the above shall be provided where indicated or where required by the National Electrical Code.

(e) Switches for Class I, Division I hazardous areas shall be Appleton Type EFS surface mounted, rocker arms, exposed wiring with poles and hubs as indicated.

40-19. Wall Receptacles:

(a) Duplex receptacles shall be "Specification Grade" brown bakelite, grounding type, 15 amperes at 125 volt equal to Hart & Hegeman No. 5262;

(b) Weatherproof receptacles shall be Hart & Hegeman No. 5272 or approved equal. Clock receptacle shall be Hart & Hegeman No. 7707.

(c) Special receptacles shall be as scheduled on the plans or as maybe required for each particular requirement.

40-20. Wall Plates and Covers:

(a) All flush wiring devices shall be covered with stainless steel wall plates as made by the Sierra Electric and Mfg. Co.

(b) All plates shall be of the same make and design except where special metal plates are normally supplied with certain receptacles.

(c) All flush junctions in finished rooms shall be equipped with blank stainless steel plates unless noted otherwise.

(d) Surface wiring devices shall be covered with suitable heavy steel covers with rounded edges and corners.

(e) All stainless steel plates for switches serving pumps, exhaust fans, unit heaters, air handling units, night switch or other special remote equipment shall have stenciling on plate indicating apparatus served. This stenciling shall be a part of the plate as performed by plate manufacturer. (On the job painting will not be acceptable.)

40-21. System:

(a) The Owner will deliver 4160 volt, three wire, three phase primary to the line side of the oil filled cutouts in Foundation Mechanical Equipment Room.

(b) This contractor shall furnish equipment for a transformation to four wire, three phase, 120/208 volt for lighting loads in this Addition. He shall also provide for three wire, three phase, 480 volt air conditioning power loads.

(c) This contractor shall remove and relocate the bank of dry transformers (existing building) and provide secondary feeders back to existing four wire, three phase 120/208 volt distribution panels.

40-22. Oil Filled Cutout and Tap Box Combination:

(a) Furnish and install three combination oil filled, fused cutouts and cable tap box combination, General Electric or approved equal.

(b) Units shall be equipped with oil, fuse links, and disconnecting blades. Units shall be No. 9F2K-6 for units rated 200 ampere and No. 9F2K-5 for units rated 100 amperes.

(c) The line connections to cutouts will be made by the Owner. All load connections from cutouts to transformers will be by this contractor.

40-23. Dry Transformers:

(a) Furnish and install all dry trasformers shown on the Plans. These shall be two winding, fully insulated types with sheet metal or cast iron enclosures. Single phase units shall be used throughout, banking as noted. The transformers shall be Westinghouse, Uptegraff or Marcus. Transformers shall have primary windings for 4160 volt and shall have secondary windings for voltage as indicated. All transformers shall have 5% taps (FCNB).

(b) This contractor shall furnish all necessary brackets, bolts, etc. required for the pad mounting of all transformers. All connections between transformers shall be with gutters or conduit and completely enclosed.

(c) Ground all transformer cabinets and the various system neutrals established by the transformer banks. Bond the units as required by the National Electrical Code.

40-24. Distribution Panel M:

(a) Panel M shall be surface mounted fully approved for use as distribution equipment. Panel shall be equal to Square D type MHP or Federal type StaBreakers. Panel shall have hinged door and keyed lock.

(b) Breakers shall be of a size and number as scheduled. Breakers shall have individual plastic cases and shall have buss connections of stab or plug design.

40-25. Branch Circuit Panels:

(a) All branch circuit lighting panels shall be equal to Square D type NQO or Federal NLAP. Panels shall have thermal magnetic breakers of stab design. Breakers shall have individual plastic cases and sized as scheduled on the Plans.

(b) Two pole and three pole breakers shall be common trip (single pole units with tie bars are not acceptable).

(c) Panels shall be flush or surface mounted, hinged doors, keyed locks, and shall be equipped with a neatly typed circuit directory card listing equipment served.

40-26. Identification Markings:

(a) The electrical contractor shall identify all electrical panels by a (1") decalcomania or neatly printed markings on inside of hinged door using its alphabetical designation as indicated on the plans, i.e., Panel "A", etc.

(b) Each safety switch shall have neatly printed on the outside of cover, its voltage and equipment served.

(c) All panel directories shall be neatly typed, indicating equipment served.

(d) All markings or painting of these items shall be done by proper craftsmen. Unsightly painting shall be removed and reinstalled at no additional expense to the Owner.

(e) Certain wall plates require stenciling; refer to section 40-20, Wall Plates and Covers:.

40-27. Insulating Bushings:

(a) This contractor shall install malleable type conduit bushings having an insulating ring on the inside of the bushings, wherever conductors of No. 4 size and larger are used; in accordance with National Electric Code Artical 3736b. Conduit bushings with "insuliner" sleeve will not be acceptable.

40-28. Fuses:

(a) Furnish and install a "Buss Fusetron" dual element fuse for each active fusholder in this project.

(b) Fuses shall be sized as scheduled or as required; no substitution on this item.

40-29. Safety Switches:

(a) Furnish and sinstall all safety switches of a size and type as indicated and scheduled on the drawings. Switches shall be fusible, non-fusible, raintight as indicated and shall be equal to those as manufactured by Square D or Federal.

40-30. Lighting Fixtures and Lamps:

(a) Furnish and install all lighting fixtures and lamps required for this project as indicated on the drawings. Fixtures and lamps shall be those noted on the schedule and as referenced to the alphabetical characters in the outlet symbols.

(b) Lamps shall be of a type, color and size as noted equal to Sylvania, Westinghouse or General Electric.

(c) All fluorescent ballasts shall carry E.T.L. and C.B.M. labels.

40-31. Wiring For Plumbing, Heating and Air Conditioning Work:

(a) Provide all wiring for the 1/4 HP unit ventilators 120/60/1. Each unit is factory wired and has built-in motor protection. Provide a 120 volt circuit from panel "D" to each unit.

(b) Provide all wiring for the fractional horsepower room units 120/60/1. Provide a 120 volt circuit from panel "D" to each unit.

(c) Furnish a disconnect and magnetic motor starter for each of the two hot-chilled circulating pumps. Pumps are 3/4 and 5 HP 208/60/3. Provide control wiring from pneumatic electric switches.

(d) Provide disconnect switches and two magnetic motor starters for the 1½ HP duplex condensate pump 208/60/3. Provide all power and control wiring.

(e) Furnish a power feeder and line connections to the control panel of the 75 HP chiller 480/60/3. Provide all conduit, flexible conduit and wiring for controls and interlocks between starters of circulating pump, cooling tower pump and control panel. The electrical contractor shall obtain a wiring diagram from the chiller manufacturer to be used and provide all power and control wiring as required. The chiller starter is furnished with the chiller.

(f) Furnish a magnetic motor starter, a raintight disconnect and all wiring for the electrical installation of the 5 HP cooling tower fan 480/60/3. Provide interlock with condenser water pump as indicated.

(g) Furnish a magnetic motor starter, disconnect and all wiring for the 5 HP condenser water pump 480/60/3. Provide interlock with circulating pump as indicated via pneumatic electric switch.

(h) Furnish a thermal overload switch and all wiring for the 1/6 HP domestic hot water circulating pump 120/60/1, and its controlling aquastat.

(i) Furnish a grounding duplex receptacle for the fractional horsepower sump pump 120/60/1.

(j) Furnish a power feeder and all wiring for the 3385 Watt Kitchenette unit 208/60/1. Provide outlet and connections to light in cabinet above this unit as indicated.

(k) Furnish a motor starter, disconnect and all wiring for the 3 HP instructional air compressor 208/60/3.

(l) Furnish a thermal-overload switch and all wiring for the 1/3 HP control air compressor 120/60/1.

40-32. Exhaust Fans:

(a) Furnish thermal-overload switches, pilot lights and provide all wiring for the various fractional horsepower, ventilation exhaust fans 120/60/1 as indicated.

(b) Provide all wiring for the various fractional horsepower exhaust fans 120/60/1 for fume hoods. Generally, fans shall be controlled by switches which are an integral part of the fume hood. Verify. Provide a Buss "fustat" for each fume hood exhaust fan.

40-33. Motorized Drapes:

(a) Lecture Rooms A125 and A313 will have motorized window shades as furnished and installed by Others.

(b) Provide all power and control wiring as required. Verify the exact location of outlets. Verify the requirements for control outlets.

40-34. Hazardous Area:

(a) All wiring for hazardous locations shall comply with the provisions of the National Electrical Code and State and Local enforcing agencies.

(b) The Rooms A111, A112 shall be wired in accordance with Article 500 of the National Electrical Code for Class I, Division I areas.

40-35. Lecture Room Projector Outlets:

(a) Furnish a power outlet in projection booth of each Lecture Room for the Owners projection equipment. Furnish a junction in booth and a ½" empty conduit to junction at front wall for future control equipment.

(b) Furnish and install in each lecture room, two R.C.A. No. MI 14875/12418 recessed wall speakers and baffles (less back box). Speakers shall be wired to a phone jack in the projection booth for audio output of projector equipment. Wire shall be Belden No. 8739.

40-36. Wiring For Instructional Equipment:

(a) Instructional equipment shall include fume hoods, lab benches and lab tables.

(b) Furnish conduit stubs, wall junctions and final connections to all instructional equipment. Receptacles and electrical fittings are furnished with tables, benches and hoods, but shall be installed by the Electrical Contractor. This shall include all wiring, conduit and connections.

40-37. Wiring for Telephones:

(a) Furnish single gang, flush wall outlets for use with telephone equipment. Provide a stainless steel wall plate for each outlet.

(b) Provide a system of conduits and outlets as indicated by the two riser diagrams.

40-38. Elevator:

(a) Furnish a power feeder and disconnect for the control panel of the 10 HP elevator 208/60/3.

(b) All wiring from disconnect switch including control wiring to each floor will be by the Elevator Contractor. Provide a 120 volt outlet at the half way point of the shaft for cab lights.

40-39. Emergency System:

(a) Furnish a feeder from the line lugs of panel M for service to the emergency system panel X. Emergency system shall include wiring to the fire alarm and exit lights.

(b) All wiring of the emergency system shall be isolated from all other lighting and power systems.

40-40. Fire Alarm:

(a) Furnish a non-coded, open circuit fire alarm system with horns and break glass stations. All wiring shall be a part of the emergency system.

(b) Fire Alarm stations shall be flush wall type, hammerless break-glass Minneapolis-Honeywell No. S-436A1X. Horns shall be flush type Minneapolis-Honeywell No. Q-432A8X, 120 volt. Equal equipment as manufactured by Stromberg Time or Edwards will be approved.

40-41. Hand Dryers:

(a) Furnish two electric hand dryers where indicated in the Toilet Rooms. Install units and provide all wiring and connections. Verify the mounting heights.

(b) Units shall be equal to American Dryers No. SE-10 single nozzle, 115 volt 15 ampere with all white cabinet and 40 second drying cycle.

50 - PLUMBING WORK

50-1. General Conditions:

(a) General Conditions Sheets 1 to 8 inclusive and Special Conditions of the Contract and Alternates Sheets 2-1 to 2-13, inclusive are a part of this specificatbn and shall be consulted as to detail.

50-2. Scope:

(a) Furnish all labor, materials, equipment, and appliances and perform all operations in connection with the provisions of plumbing work, complete in strict accordance with the specifications and drawings and subject to the terms and conditions of the contract.

50-3. General:

(a) The work covered by this specification consists of furnishing all labor, materials, and equipment shown on the plans and herein specified to completely construct a system of plumbing in the Science Building Additions and Alterations, Fort Hays Kansas State College, Hays, Kansas, and subject to the terms and conditions of this contract.

(b) All work shall be fully complete to include; all soil, waste and vent lines, floor drains, sanitary sewers; waste and vent lines, floor drains, dilution chambers of the acid resisting (duriron) system, roof drains, floor drains, waste and vent lines of the storm water and condensate systems; domestic hot and cold water piping, domestic hot water return piping; gas, compressed air and all other fixtures and equipment as hereinafter specified or shown on the drawings.

(c) The drawings indicate the extent and general arrangement of the plumbing system. If any departures from the drawings are deemed necessary by the contractor, details of such departures and reasons therefor, shall be submitted as soon as practicable to the state architect for approval. No departures shall be made without the prior written approval of the state architect.

50-4. Cutting, Patching and Debris:

(a) This contractor shall do all cutting and patching required for his work. Permission shall be obtained first.

(b) Provide the removal of all crating, packing and debris caused by him. Maintain tools, equipment and the materials used for this installation in a neat and orderly manner, and located so as not to interfere with the work of others.

50-5. Laying Out of the Work:

(a) This contractor shall thoroughly study the complete set of drawings and specifications before commencing work. He shall take his own measurements and shall be responsible for the same.

50-6. Standard Products:

(a) All major items of mechanical equipment shall be of the best quality normally used for the purpose in good commercial practice and shall be the products of reputable manufacturers. Each major compenent of equipment shall have the manufacturer's name, address and catalog number of the name plate securely affixed in a conspicuous place. The name plate of a distributing agent only will not be acceptable. All belts, pulleys, chains, gears, couplings, projecting set screws, keys and other rotating parts located so that any person may come in close proximity thereto, shall be fully enclosed or properly guarded.

(b) All material and equipment shall be new, of best quality and design and free from defects. All material and equipment to be furnished under this specification shall be essentially the standard product of manufacturers regularly engaged in the production of such equipment and shall be of the manufacturer's latest standard design. Where two or more units of the same class of equipment are required, these units shall be products of a single manufacturer; however, the component parts of the equipment need not be products of the same manufacturer.

(c) The manufacturer and model numbers listed, in these specifications, establish type and quality.

(d) Defective equipment, or equipment damaged in the courses of installation or test, shall be replaced or repaired in a manner meeting the approval of the state architect.

(e) Materials, such as adhesives, plastic insulation, glue size, fungicidal agents, insulation materials, etc., shall be delivered on the job in the original labeled containers.

(f) As soon as practicable, and within 30 days after the date of award of contract and before any materials or equipment are purchased, the contractor shall submit, to the state architect for approval, a complete list, in five copies, of materials and equipment to be incorporated in the work. The list shall include catalogs, cuts, diagrams, drawings, and such other descriptive data as may be required by the state architect. No consideration will be given to partial lists submitted from time to time. Approval, by the state architect,

of materials and equipment will be based on manufacturer's published ratings and any material and equipment listed which are not in strict accordance with the specification requirements will be rejected.

(g) If the contractor fails to submit for approval within the specified time, a list of materials and equipment in accordance with the preceding paragraph, the state architect will select a complete line of materials and equipment. The selection thus made by the state architect shall be final and binding and the items shall be furnished by the contractor without change in the contract price or the time of completion.

50-7. Use of Premises:

(a) The mechanical contractor shall confine his apparatus, storage of materials and the operations of his workmen to limits indicated by law, ordinances, permits or directions of the state architect, and shall not encumber the premises with his materials. The contractor shall not load or permit any part of the structure to be loaded with a weight that will endanger its safety. The contractor shall enforce the instructions of the state architect regarding signs, advertisements, fires and smoking.

50-8. Openings, Sleeves, Chases:

(a) The general building contractor will leave such openings and chases for pipes, cabinets and equipment as may be necessary or directed by the state architect to facilitate the working of the mechanical contractor and refinish around same; provided, however, that the mechanical contractor is on the job in due time to properly advise as to locations and sizes of such openings and chases.

50-9. Temporary Heat:

(a) The general contractor will furnish all temporary heat until the heating system in the building can be placed in operation. It will be the responsibility of the heating contractor to place the building heating system in operation as soon as possible. The mechanical contractor shall coordinate his work so as to place the heating system in operation as soon as possible.

50-10. Wiring For Plumbing Equipment:

(a) All wiring and electrical connections will be furnished by the Electrical Contractor as indicated in these specifications.

(b) The Electrical Contractor shall perform the following:

1. Furnish a grounding duplex receptacle for the fractional horsepower sump pump 120/60/1.

2. Furnish a thermal overload switch and all wiring for the 1/6 HP domestic hot water circulating pump 120/60/1 and its controlling aquastat.

3. Furnish a power feeder and all wiring for the 3385 Watt Kitchenette unit 208/60/1. Provide outlet and connections to light in cabinet above this unit as indicated.

4. Furnish a motor starter, disconnect and all wiring for the 3 HP instructional air compressor 208/60/3.

50-11. Permits and Codes:

(a) All licenses, permits, fees, etc., associated with the installation and connection of utilities furnished and installed under this section shall be paid by the mechanical contractor.

(b) The entire plumbing installation shall be in full compliance with the requirements of the "American Standard National Plumbing Code (ASA A 40.8-1955) as published by the American Society of Mechanical Engineers, 29 West 39th St., New York 18, N.Y., and all local codes having jurisdiction.

50-12. Painting:

(a) All plumbing equipment and piping furnished and installed under this section will be painted by the general contractor. This will include all insulated and uninsulated surfaces and piping in connection with the plumbing.

(b) Aluminum surfaces, electric motors, brass valves, brass trim and bright metal items shall not be painted.

(c) All pipe covering and insulated surfaces furnished and installed under this section, in the crawl space, horizontal and vertical pipe chases, and all other locations, shall be given a heavy coat of glue size, with a sufficient amount of fungicidal agent shall be furnished and applied on insulated surfaces under this section by the mechanical contractor.

50-13. Materials and Equipment:

(a) Cast iron bell and spigot pipe and fittings shall be extra heavy cast iron soil pipe and shall conform to the requirements of the ASTM Standard Specifications for Cast Iron Soil Pipe and Fittings, ASTM Designation A74-42.

(b) Acid-resisting waste, vent and fittings shall be bell and spigot Duriron, or as noted on drawings. Joints in this pipe shall be made up with No. 190X packing as made by the Duriron Company, Inc.

(c) Clay sewer pipe and fittings shall be standard strength clay sewer pipe and shall conform to the requirements of the ASTM Tentative Specifications for Standard Strength Clay Sewer, ASTM Designation C13-50T.

(d) Wrought iron pipe shall be as manufactured by Byers and shall conform to the Tentative Specifications for Welded Wrought-Iron Pipe ASTM Designation A72-52T.

(e) Black or galvanized steel pipe shall conform to Standard Specifications for Black and Hot-dipped Zinc-Coated (Galvanized)Welded and Seamless Steel Pipe for Ordinary Uses - ASTM Designation A120-47.

(f) Lead pipe as part of the acid-resisting drain and vent system shall conform to Fed. Spec. W.W.-P-325.

(g) Pig lead shall conform to the ASTM Standard Specifications for Pig Lead, ASTM Designation: B-29-49.

(h) Hot-poured bitumastic joint compound shall be C.P.I.-2, or approved equal, as manufactured by the Koppers Company, Inc., Pittsburgh, Pa.

(i) All changes in direction shall be made with fittings. All fittings screwed and welded shall be standard weight. The welding ells, tees, and reducers shall conform to the ASTM Specifications Designation A-234-52AT. The welding neck flanges shall conform to the ASTM Specification Designation A-181-Grade I. Fittings for use with screwed pipe, other than soil and waste piping, shall be best quality, malleable iron and shall conform to the American Standard for Malleable Iron Screwed Fittings, 150 lb.,(A.S.A. No. B16.S-1951) of the American Standards Association. Fittings to be used with soil and waste piping shall be galvanized cast iron drainage fittings. Standard weight ground joint unions shall be used instead of right and left couplings and nipples where pipes are joined together. Unions larger than 2½" shall be flanged.

(j) All flanged joints shall be faced true, packed and made perfectly square and tight. Gaskets for flanged connections shall be Garlock, or approved equal, No. 555 packing, with centering ring.

(k) Copper piping shall be type K seamless hard drawn and shall conform to Standard Specification for Seamless Copper Water ASTM B88-51. Fittings shall be cast bronze or wrought copper solder fittings.

(l) All valves shall be best quality, full weight, Crane, Jenkins, Lunkenheimer, Walworth, or approved equal, as hereinafter specified. Valves 2½" and smaller are to be all brass. Those larger than 2½" are to be iron body, brass mounted. Valves larger than 2½" shall be flanged. Those smaller in size may be screwed. All valve stems are to be packed with graphite

asbestos wicking. Gate valves shall be used in all places where valves are specified or indicated on plans, unless otherwise called for. Valves not specified or indicated, but required for proper operation of the piping system, shall be furnished and installed by this contractor.

50-14. Excavation, Trenches and Back Filling:

(a) All excavation and trenches necessary for any work under this contract shall be done by this contractor. Trenches shall be excavated to the required depth. The bottom of trenches shall be tamped hard and graded to secure the required fall. Bell holes shall be excavated so that pipe will rest on solid ground for its entire length. Sewer and water pipes shall be laid in separate trenches.

(b) This contractor shall back-fill all excavation and trenches excavated under this contract, thoroughly settling and leveling earth in such back-fill, and remove all surplus earth.

(c) This contractor shall do all pumping necessary and required to keep trenches free of water and shall keep stoppers in open ends of pipe when pipe laying is not in progress.

(d) This contractor shall tamp dry earth into place at sides of pipes, leaving tops and joints exposed until piping runs have been tested, as specified hereinafter.

50-15. Sanitary Sewer:

(a) Contractor shall furnish and install as shown on the drawings and herein specified, a complete drainage system. All piping shall be of the type herein specified, or shown on the drawings, laid true to line and uniformly graded. All pipes shall be left unobstructed and clean inside. Flush sewers with water to obtain free flow.

(b) Any changes in line or grade, or connection to branches shall be made with proper curved fittings made for the purpose. Sewers shall be equipped with clean-outs as herein specified, shown, and required.

(c) The existing main sanitary sewer shall be removed and replaced with a new cast iron sewer suspended in the tunnel. Replace runs from the existing building to new sewer main as required. Work shall include two new manholes. Sanitary Sewer shall have a minimum grade of .035%.

(d) Work shall be arranged so as to allow the existing building to be used during normal occupation.

50-16. Storm Sewer:

(a) Install a storm sewer system, complete and independent of the sanitary sewer, which shall terminate in existing catch basin in street curb (See Plot Plan).

(b) All roof drains and areaway drains shall connect to the storm sewer system (except areasway drain to basement). Storm sewer shall be given an even grade from the building to the catch basin.

50-17. Acid Resisting Drain System:

(a) All acid resisting waste lines, their vents and fittings shall be Duriron as previously specified. Piping shall be as herein specified or shown on the dravings.

(b) This work shall include the piping from laboratory equipment dilution chambers and discharge lines to the sanitary sewer. The concrete vaults for the dilution chambers will be built by the General Contractor. Provide lead pipe between fixture connections and Duriron pipe as required. Joints of lead pipe shall be wiped and shall have brass ferrules.

50-18. Soil, Waste and Vent Pipes:

(a) The principal soil, waste line, and vent stacks are shown on the plans. This contractor shall furnish and install such branch, soil and waste pipes, vent stacks and risers as may be required to make a complete and first class installation in addition to the pipes as shown. It is not intended that these pipes must be run exactly as shown on the plan, as it will be necessary to vary these to avoid columns, beams, pipes and other obstructions. In all cases the location must meet with the approval of the state architect. Where pipes are to be suspended from concrete or other types of construction, they shall be kept as high as possible and the soil lines must be held to the minimum grading of 1/8" per foot for drains over 3" in diameter, drains 3" in diameter and smaller shall have a slope of 1/4" per foot within the building.

(b) Pipe used in this system that is 2½" diameter and smaller shall be galvanized wrought iron. Drains and vents larger than 2½" diameter shall be cast iron. Any part of this system that occurs in fill shall be run in cast iron.

(c) Fittings for soil, waste and vent piping that occur in fill under floors shall be cast iron. Fittings used above floor lines shall be cast iron drainage type for small diameter (2½" and under) soil and waste lines. Fittings for large diameter (above 2½") soil, waste and vent lines shall be cast iron soil fittings.

(d) All changes in pipe size on soil, waste and drain lines shall be made with reducing fittings. All changes in direction shall be made by the appropriate use of 45 degrees wyes, half wyes, long sweep quarter bends, 1/6, 1/8, or 1/16 bends, except that sanitary tees may be used on vertical stacks, and short 1/4 bends or elbows may be used in soil or waste lines where the change in direction of flow is from the horizontal to the vertical, and on the discharge from water closets. Where it becomes necessary, because of space conditions, to use short radius fittings in any other locations, the approval of the state architect shall be obtained before they are installed.

(e) Where a union connection is used on soil, waste, vent or drain piping 3" in diameter or larger, a tucker connection or flange union shall be used. The use of long threads and bushings is prohibited.

(f) The use of lead pipe will be restricted to the short branches required for roughing-in where other pipe cannot be used. Lead pipe joints are to be wiped and have brass ferrule connections.

(g) Joints between cast iron bell and spigot pipe shall be made with a packed oakum gasket and pig lead. Joint shall be run full at one pouring and caulked solid, flush with hub. Joints between cast-iron bell and spigot pipe and wrought iron, steel, or brass pipes shall be made same as above. The end of the wrought iron, steel, or brass pipe shall have a ring or part of a coupling screwed on to form a spigot end. Connections between lead and wrought iron or cast iron pipe shall be made with brass fittings and wiped joints.

(h) Joints between vitrified clay pipe and cast iron pipe and joints between all vitrified clay pipe shall be hot poured bitumastic joint compound and shall be such that it will not soften sufficiently to destroy the effectiveness of the joint when subjected to a temperature of 160 degree F. nor be soluble in any of the wastes carried by the sewer system. The joint compound shall be installed in accordance with the manufacturer's recommendations.

(i) All soil and waste pipe lines are to be run as indicated on the plans, unless some condition should arise which would make it necessary or seem advisable to alter the same, in which case, the state architect or his superintendent must be consulted before making any change. All soil pipe and vents from fixtures shall be run as shown on the drawings.

(j) The bottom of all vents shall be fitted with a proper seat to rest on a malleable bracket, concrete pier or other approved support to carry the weight of the pipe above. Where lines extend vertically through floors, they shall be properly and securely anchored to prevent undue movement.

(k) Horizontal soil, waste and drains shall be installed with a grade of 1/4" per foot on pipes 3" diameter and smaller, and 1/8" per foot on lines larger than 3" diameter.

(l) All main vertical soil and waste stacks shall be installed with provisions for expansion and shall be extended full size to and above the roof lines as vents.

50-19. Floor Drains:

(a) All floor drains called for in these specifications shall be Asco, Zurn, Blake, Josam or approved equal, and shall be sized, trapped and connected as shown on the drawings. Items as part of the acid resisting drain system shall be Duriron.

(b) All floor drains that connect to the sanitary sewer system shall be Asco No. 1242-1342, outlet size 2", 4" diameter nickel bronze strainer, cast iron body with seepage pan and seepage holes.

(c) All floor drains that connect to the acid resisting drainage system shall be Duriron 5501-B, outlet size 2", Durimet 20 strainer.

50-20. Roof and Areaway Drains:

(a) Furnish and install drains on the roof and in areaways as indicated on the plans. Drains to be Asco, Blake, Josam or approved equal.

(b) Roof drain shall be Josam Series 400, 4" outlet, cast iron body, cast iron dome and sediment cup with flashing clamp device and gravel stop, and concrete anchor flange.

(c) Areaway drain to the foundation equipment room shall be equal to Josam Y-60 series with 3" outlet, cast iron, square hopper with inside caulk bottom outlet, grate and strainer. Areaway drain for cooling tower shall be equal to Josam No. 144 cast iron, inside caulk bottom outlet, flat grate in recessed sump.

(d) Vertical leaders (above grade) shall be galvanized wrought iron supported at each floor level with heavy duty pipe clamps. Horizontal runs shall be a part of the storm sewer and shall be cast iron where below slabs and vitreous clay pipe where indicated on the Plot Plan.

50-21. Manholes:

(a) The plumbing contractor shall remove the existing manhole cover and ring and furnish and install material for two new manholes.

(b) Brick for manholes shall be hand common brick meeting ASTM Specifications C62-50. Wall thickness shall be 8".

(c) Manhole ring and cover may be re-used from existing manhole. New ring and cover shall be of a weight and size as scheduled. Cover shall not be perforated.

(d) Concrete for manhole construction shall be 1:2:4 mix of Portland cement, clean sharp sand and clean, screened 3/4" limestone aggregate. Use not less than 5½ sacks of cement per cubic yard of concrete and not more than 6-3/4 gallons of water per sack of cement. Masonry mortar shall be 1:3 Portland cement sand mix.

(e) Lay bricks in manholes with shaved joints, completely filled with mortar. Horizontal joints shall not exceed 1/2" vertical joints 1/4" on interior face. Lay brick as headers, breaking joints between courses. Strike interior joints smooth with face of brick.

(f) Apply 3/4" cement plaster on outside of manhole structure.

50-22. Cleanout Plugs and Test Tees:

(a) Provide and install cleanouts where indicated on the drawings and at the foot of all soil, waste and drain stacks, bends, angles, upper terminals, and not over 50 feet apart in any lineal run of piping. All shall be accessible; if not, they shall be extended to an accessible location, such as outside the building or to the floor above. Cleanouts extended to finished floors and walls shall be set flush with the finished surface.

(b) Cleanouts in finished floors shall be Zurn Z-1326-1, Asco, or approved equal, with nickel bronze non-slip scoriated square top set flush with floor.

(c) Cleanouts in unfinished floors and outside areas shall be Zurn Z-1326-10, Asco, or approved equal, with non slip scoriated vandal-proof cover, set flush with surface in non-surfaced areas, they shall be set in a concrete block, 14" x 14" square, and 6" deep, and set flush with finish grade.

(d) Cleanouts in finished walls shall be Zurn Z-1315-1, Asco, or approved equal, or Z-1305 in soil lines, or "Code" red brass plugs in IPS lines and shall be covered with Z-1375-1 bronze access box with full 8" x 8" opening and smooth chromium plated top which shall be set flush with the finished wall and held securely in place by means of integral offset anchoring lugs.

(e) Cleanouts in unfinished walls and accessible concealed spaces shall be Zurn z-1315, Asco, or approved equal, or Z-1300 in soil pipe lines or "Code" red brass plugs in IPS lines.

50-23. Flashings:

(a) Where vent stacks extend through the roof, they shall be flashed and counter-flashed around with 6 lb. sheet lead having adequate roof flanges and shall be made and warranted waterproof.

50-24. Traps:

(a) Each fixture and piece of equipment requiring connections to the various drainage systems shall be equipped with a trap. In some cases, the fixtures and equipment as specified do not have integral trap. The trap installed with these items shall be of the same or suitable material to insure a proper and complete connection. Each trap shall be as close to the fixture as possible and no fixture shall be double trapped. Traps installed on cast iron bell and spigot pipe shall be extra heavy.

50-25. Pipe Sleeves, Hangers, Supports and Cover Plates:

(a) Pipe sleeves, hangers, supports and cover plates shall be furnished and set by this contractor who shall be responsible for their proper and permanent location. In general, pipes shall not be permitted to pass through footings, beams or columns.

(b) Pipe sleeves shall be installed and properly secured in place at all points where pipes pass through masonry or concrete, except through unframed floors on earth. Pipe sleeves shall be of sufficient diameter to provide approximately 1/4" clearance around the pipe, and in the case of insulated pipe approximately 1/4" clearance around insulation. Pipe sleeves in walls and partitions shall be of cast, wrought iron or steel pipe. Pipe sleeves in floors shall be 20 gauge galvanized

sheet steel. All metal sleeves through the floor and walls shall be furnished by this contractor. Sleeves in floors in toilet rooms shall extend not less than 1" and not more than 2" above the finished floor, and after installation of pipe, the space around the pipe shall be packed with plastic material and made water tight.

(c) Flashing sleeves shall be installed where pipes pass through waterproofing membranes. The sleeves shall be provided with a flashing flange or a clamping device to which a flashing shield can be clamped or soldered. Flashing shields shall be of 16 oz. soft sheet copper and shall extend not less than 8" from the sleeve flashing flange. Shields shall be thoroughly mopped into the waterproofing membrane. The space between the pipe and the sleeve shall be made water tight by inserting a packed oakum gasket and filling the remaining space with poured lead and caulking thoroughly. Flashing sleeves shall be Asco Series 6370 or 6380, or approved equal.

(d) All piping under this section shall be properly supported by means of metal hangers and inserts. These shall be spaced so as to prevent all sagging and vibration; not more than 10 feet apart, and to be so designed as to provide for expansion. Hanger inserts for the piping, where necessary, shall be set in the concrete slab. The mechanical contractor may utilize hanger inserts installed by the heating contractor wherever possible and with his consent. Hanger inserts shall be furnished to the general contractor for insertion in the concrete as noted above. Beam clamps shall be used where piping will be supported by beams. Hanger inserts shall be 3000 Series Unistrut, or approved equal, for multiple runs. Hanger inserts shall be No. 151 Grinnell, or approved equal, for single runs. Inserts shall be installed in accordance with the manufacturer's recommendations. Hangers for the single and multiple pipe runs shall be adjustable Grinnel No. 101 and 101B, Barrett, or approved equal, metal ring hangers and shall be properly sized to the pipe. Hangers in tunnels shall be Unistrut, or equal. The use of of strap hangers in lieu of those specified will not be acceptable. Pipe hanger inserts shall be spaced not more than 10'-0" apart, and pipes 1/2" or smaller shall have intermediate supports. Pipe hangers and inserts to support the plastic piping system shall be as above specified and installed strictly according to the manufacturer's recommendations and specifications. All vertical pipes must be securely supported at the floors or ceiling through which they pass and at intermediate points where necessary.

(e) Cover plates shall be furnished and installed on all uncovered pipes which pass through floors, walls, ceilings and partitions in finished rooms, and around all pipe hanger rods which pass thru finished ceilings of plaster or gypsum board. Cover plates shall be chromium plated brass. Where pipe hanger rods pass thru plaster ceilings, plaster rings shall be furnished to permit free movement of the rods.

50-26. Hot and Cold Water System:

(a) Furnish and install hot and cold water supply systems complete, including connections to the cold water main as shown on the Plot Plan.

(b) Remove the hot water converter and storage tank in the existing building. Reconnect existing hot water mains to the new system as indicated.

50-27. Domestic Hot Water Storage Heater:

(a) Furnish and install a 30" diameter by 60" long hot water storage heater with a "U" tube heating element constructed of copper tubing. Tank shall be constructed to ASME code for unfired pressure vessels for 125 p.s.i. W.P. tank shall have an 11" x 15" manhole in the end, a thermometer and necessary tappings as indicated.

(b) Complete tank and heating coil shall be equal to Sims with Sims 6 BH2 coil with a capacity to heat 200 GPH (from 40 degrees F to 140 degrees F) with 5 p.s.i. steam. Furnish welded steel pipe stand as detailed on the plans.

(c) Tank shall be lined with corrosion resistant coating of hydraulic cement. Tank shall carry a 10 year guarantee against corrosion.

(d) Install a Watts No. 40 XL pressure and temperature relief valve sized 3/4". See Section 60 for steam specialities.

50-28. Water Pipe, Fittings and Connections:

(a) All pipe for the building water system shall be type K seamless copper pipe.

(b) All fittings shall be wrought copper sweat type.

(c) A gate valve and drain on each service line shall be installed inside building. Piping shall extend to all fixtures, outlets and equipment from the gate valve. The cold water system shall be installed with a fall toward the shut off valve. Hot water lines shall start from the hot water heater, per plans.

(d) Pipes shall be supported by copper plated hangers and inserts.

(e) After roughing in is done and before pipes are concealed, all open ends of pipes are to be sealed and system filled with water. If any leaks develop, remove defective parts and replace or repaired satisfactorily. Unions shall not be concealed in walls or ceilings. State Architect or his representative shall be present at test. Use dielectric unions at connections of iron or steel pipe to copper pipe.

(f) No plumbing fixtures or piping shall be installed which will provide a cross connection or inter-connection between a distributing supply for drinking water or domestic purposes and polluted supply such as drainage system or a soil or waste pipe which will permit or make possible the back flow of sewage, polluted water, or waste into the water supply system.

(g) All piping runs shall be installed per plans, concealed wherever possible and exposed where ceilings are unfinished. All pipes shall be cut accurately to measurements taken at the building by the contractor and shall be worked into place without springing. Structural portions of the building are not to be weakened by this work. All service pipe valves and fittings shall be kept clear from other work to allow finished covering. Minimum 1/2" from other work and not less than 1/2" between finished covering on the different surfaces. No water piping shall be buried in floors unless so indicated. Changes in pipe sizes shall be made with reducing fittings.

(h) Pipe drains shall be 1/2" globe valves with renewable discs and 3/4" hose nipples. Added drains shall be installed at low points on the hot water and cold water piping, and all piping shall grade down to the drains.

(i) Air chambers shall be provided on all supplies both hot and cold, near each faucet, control valve, flush valve and riser ends. Chambers shall equal in length to at least 12" diameters of the pipe.

50-29. Gas Supply System:

(a) The mechanical contractor shall furnish and install a complete gas supply system including the connection to the existing gas mains as shown on the drawings.

(b) Remove and relocate the existing pressure regulator and install new service to the existing building and this Addition.

50-30. Gas Piping, Fittings and Connections:

(a) All pipe, nipples and couplings for gas piping shall meet Standard Specifications for Black Steel Pipe, ASTM A120-47.

(b) All fittings shall be malleable iron. Standard weight ground joint unions must be used instead of right and left hand couplings and nipples where pipes are joined together.

(c) After cutting and before threading, all pipe shall be reamed and shall have all burrs removed. All screws joints shall be made with graphite and oil, lead and oil, or other approved "dope" applied to the male threads only. Threads shall be full cut, and not more than three threads shall remain exposed. Caulking of threaded joints to stop or prevent leaks will not be permitted. Unions shall be used for all branch connections to risers and mains.

(d) Pipes shall be supported from floor construction by Grinnell No. 101, or approved equal, metal ring hangers set in concrete floor or securely anchored to wood floor joists and wedged as to prevent vibration. Gas pipes in general shall run exposed close to ceilings and walls. Pipe shall be supported by hangers or brackets at spacing not exceeding 10'-0" and pipes 1/2" in diameter shall have intermediate supports.

(e) Where a union connection is needed, shown, or specified on any pipe 2" in diameter or smaller , a malleable iron, ground joint union shall be used. On pipes 2½" in diameter and over, a flanged union shall be used. Gaskets on flanged unions shall be best quality rubber gaskets, 1/16" thick.

50-31. Compressed Air Supply Piping:

(a) Compressed air supply piping shall be same as specified for gas piping. All sections of 50-30 Gas Piping. Fittings and Connections shall apply also to compressed air piping.

50-32. Valves and Special Connections:

(a) Valves shall be installed at locations shown on the drawings, where specified, and where required for the proper functioning of the systems as directed by the state architect. All valves shall be installed with their stems above the horizontal.

(b) Gate valves shall be standard 125 lb. brass screwed gate valves with rising stem and solid wedge disc, Crane, Walworth, Jenkins, or approved equal.

(c) Globe valves shall be standard 150 lb. brass globe valves with plug type disc and renewable seat rings, Crane, Walworth, Jenkins or approved equal.

(d) Check valves shall be standard 125 lb. screwed swing check valves with brass disc, Crane, Walworth, Jenkins or approved equal.

(e) Balancing cocks, as shown as part of the recirculating hot water system, shall be standard 125 lb. brass, square head cocks, Crane, or approved equal.

50-33. Individual Fixtures and Supplies:

Fixtures	Cold Water	Hot Water	Vent Lines	Waste Lines
Lavatories	1/2"	1/2"	1-1/4"	2'
Water Closets	1"		2"	4'
Urinal	1"		2"	4'
Drinking Fountain	1/2"		1-1/4"	1-1/2'

50-34. Pipe Covering and Insulation:

(a) Hot Water Lines: all hot water piping and hot water circulating piping throughout the building, including chases and pipe corridors, shall be covered with preformed,

molded, sectional, bonded-glass fiber pipe insulation. Pipe insulation shall be low pressure type, 1/2 inch thick with an average "K" factor not exceeding 0.25/BTU/sq.ft./inch/hour/ degree F at 75 degree mean temperature. Insulation shall have a standard weight, factory-applied, white canvas jacket. In applying, the canvas flap shall be loosened and the cylinder opened, then carefully fit the insulation to the pipe so that the end to end and the longitudinal joints are tightly butted together to give heat-tight joints. Secure the flap with wheat paste and smooth out to give a neat and finished appearance. Stapling will not be permitted. Insulation shall fit tight to pipe. Provide expansion joints at 30 foot intervals in all continuous runs of pipe which have no side take-offs.

1. All fittings, valve bodies, flanges, and pipe hangers shall be insulated with a 1/2" layer of Eagle-Picher, or approved equal, "One-Cote Cement", followed by a 1/4" layer of E-P No. 99 or approved equal, asbestos finishing cement. Both layers of insulating and finishing cement shall be troweled to a smooth even finish and shaped to give a neat appearance, and then finished with standard weight canvas pasted in place. Insulation shall have the same thermal characteristics as specified above for piping, Hanger rods and turnbuckle adjusters shall not be insulated.

2. Where hot water lines occur in finished rooms, the contractor shall apply an additional finish cover of white 6 oz. canvas securely and neatly pasted on and sized for painting. Finish cover of 6 oz. canvas shall be applied over all such exposed pipe, fittings, valve bodies, flanges etc.

3. All pipe insulation shall have a heavy glue size applied which shall have a fungicidal agent added. All painting shall be as hereinbefore specified under painting.

(b) Cold Water Lines; all cold water piping throughout the building, including chases, and pipe corridors, shall be covered with preformed, molded, sectional, bonded-glass fiber pipe insulation. Pipe insulation shall be low pressure type, 1/2" thick, with an average "k" factor not exceeding 0.25 BTU/sq.ft./inch/hour/degree F at 75 degree mean temperature Insulation shall have a factory applied integral vapor barrier jacket. In applying the vapor barrier jacket flap shall be loosened. Coat the 2-1/3" flap of the jacket with vapor barrier adhesive, Rubber Adhesive Corp., or Bondmaster Rubber Lap Cement. Flap shall be completely coated with adhesive. Open insulation cylinder and carefully fit the insulation to the pipe, so that the end to end and the longitudinal joints are tightly butted together to give tight joints. Secure the jacket flap and smooth out to give a neat

and finished appearance. Wrap 4" wide bands of vapor barrier jacket material, coated on one side with the above type of adhesive tightly around each end joint and around the middle of each section of insulation. Stapling will not be permitted. Insulation shall fit tight to pipe. Provide expansion joints at 45' intervals in all continuous runs of pipe which have no side take-offs. Sleeves shall be provided to protect the covering at the pipe supports in the tunnel.

1. All fittings, valve bodies, flanges, and pipe hangers shall be insulated with flexible, glass fiber, blanket insulation wrapped firmly under compression (minimum 2 to 1) and held in place with spiral windings of jute twine. Blanket insulation shall then be coated with vapor-barrier mastic, "Seal fas 30-36", Berry Foster Co., or approved equal, lapped over and on to the adjacent pipe covering jacket to provide a continuous seal. Allow the mastic to set and then cover with 1/4" of Eagle-Picher, or approved equal, "One-Cote Cement" trowelled on. Cover the cement, while still plastic with standard weight canvas or glass fabric. Finish the fitting with a 1/4" layer of E-P 99 , or approved equal, asbestos finishing cement trowelled to a smooth even finish and shaped to give a neat appearance. After the final coat of cement has set, paint with a coat of Sealfas 30-36 to give a finished surface. Insulation shall have the same thermal characteristics as specified above for piping. Hanger rods and turnbuckle adjustors shall not be insulated.

2. Where cold water lines occur in finished rooms, the contractor shall apply an additional finish cover of white 6 oz. canvas, securely and neatly pasted on and sized for painting. Finish cover of 6 oz canvas shall be applied over all such exposed pipe, fittings, valve bodies, flanges, etc.

3. All pipe insulation shall have a heavy glue size applied which shall have a fungicidal agent added. All painting shall be as hereinbefore specified under painting.

(c) Roof drain lines shall be insulated with molded 1" thick snap on glass fiber pipe insulation with factory applied vapor barrier jacket. Piping surfaces to be insulated shall be clean and dry before the insulation is applied. The vapor barrier jacket longitudinal seam and end joint strip overlap shall be sealed with a suitable vapor barrier adhesive and further secured with one metal band applied over each end joint sealing strip and one at midsection of the insulation. A coating of vapor barrier adhesive shall then be applied over

all seams. Fittings and flanges shall be insulated with snap on glass fiber pipe insulation, securely held in place. A 1/4" thick coat of hard finish insulating cement shall then be applied and finished by wrapping with friction tape, open-mesh cloth or glass fabric, heavily coated with a suitable vapor barrier mastic. Ends of pipe insulation shall be sealed off with a suitable vapor barrier mastic at fittings, flanges, direct contact hangers and every 20 ft. on straight pipe.

50-35. Plumbing Fixtures:

(a) This contractor shall furnish and install, complete, all fixtures shown on the plans or called for in these specifications. All fixtures shall be supplied with stops.

(b) All fixtures shall be set firm and true, connected to all required piping service ready for use. All china fixtures shall be of the best grade vitreous ware without pit holes or blemishes. All fixtures shall be of one manufacture throughout the entire installation, except as hereinafter specified.

(c) The contractor shall provide all necessary material and labor to connect to the plumbing system all fixtures and equipment having plumbing connections. All drainage connections to these fixtures and equipment shall be trapped. Exposed traps and supply pipes for all fixtures and equipment shall be connected to the rough piping system at the wall or floor unless otherwise specified under the item.

50-36. Fixture List:

(a) Water Closets: Crane #3-450 Walton syphon jet, elongated rim, 1½" top spud wall bowl, Sloan #110FYV Royal flush valve with vacuum breaker, 1" screw driver stop and flush connection; Church #395-C white open front seat less cover, with check hinge; Smith #5A-V closet fitting and carrier for 6" walls with cantelever foot support (Smith #5A-H series carrier for closets E301A).
Toilet Room 107C Crane #3-127 siphon jet, elongated rim, Vitreous china tank #9-631 3/8" supplies, floor outlet; Seat #395-C white open front, floor outlet.

(b) Lavatories: Crane #1-195-S Norwich, wall hung, 20" x 18" vitreous china lavatory with back, concealed hangers and wall screws #8-575-A supply and indirect lift waste fitting with aerator. #8-304 - 3/8" angle supplies with stops. #8-401 -1½" 17 gauge bent tube adjustable "P" trap with cleanout.

(c) Urinals: Room A119 Crane #7-98 Sanuro, siphon jet, pedestal urinal, 1¼" back inlet, Sloan No. 333 Royal wall concealed flush valve with foot pedal 1" female union outlet (6" wall thickness). Room E301A, Crane No. 7-101 Expedis blowout, wall hung back inlet, Sloan No. 333 Royal wall concealed flush valve with foot pedal 1" female union outlet, Smith No. 6A Chair Carrier.

(d) Service Sink: Crane #7-563 acid resisting, porcelain enameled cast iron, roll rim service sink with 12" high back and concealed wall hanger size 24"x20"x12"; #8-101 -1/2" rough chromium plated utility sink faucet with hose and spout and pail hook; trap standard with metal strainer and rough brass clean-out, #8-980 cast brass rim guard.

(e) Emergency Showers: Speakman #S-2075 8" shower, 1" inlet, self closing valve with chain to floor and floor flange.

(f) Drinking Fountains: Oasis Model OW-13 wall hung electric drinking fountain, 1/4 HP, 120/60/1 air cooled, stainless steel top wall hanger, to cool 13 GPM from 80 degree F to 50 degree F at 90 degree F room temperature.

(g) Exterior Wall Hydrants: Woodford No. 9 freeze proof hydrants for proper wall thickness with 3/4" inlet.

50-37. Special Equipment:

(a) Dilution Chambers: Knight-Ware sumps No. 401 style B with an 18" diameter chamber as manufactured by the Maurice A. Knight Company, Akron, Ohio, or approved equal. Sumps shall be filled to the proper level with marble chips, size 1" to 3". These chambers shall be installed in concrete vaults as provided under the General Contract.

(b) Recirculating Hot Water Pump: Pump as a part of the domestic hot water recirculating system shall be Bell and Gossett No. 1HV all bronze body, 1/6 HP 120/60/1 capable of 10 GPM at 12 ft. head. Furnish and install a Honeywell No. L4006A immersion aquastat as indicated for pump control.

(c) Sump Pump: Furnish a Fenberthy No. 46 sump pump for a 2 ft. sump as indicated. Pump shall have a 1/3 HP motor 120//60/1. Pump shall be installed in sump furnished by Others in the condeshate pit. Pump shall be capable of delivering 2200 g.p.h. at 10 ft. head.

(i) Air Compressor & Accesories:

1. Air Compressor: Furnish and install a 3HP two stage tank mounted air compressor, with displacement of 15.6 c.f.m. pressure range of 140-175 p.s.i. and automatic unloader. Tank shall be designed for 200 p.s.i. working pressure with storage capacity of 80 gallons. Motor shall be for 208/60/3. Complete unit shall be Binks No. 33-1032, or approved equal, Provide 2" air intake line with head outside building as shown on plans.

2. Accessories: As part of the compressed air system, furnish and install in discharge line near the compressor, a light duty condenser for removal of moisture, oil and dirt, DeVilbiss type CC-506 or approved equal. Adjacent to the condenser, furnish and install a general purpose reducing valve, inlet pressure 250 p.s.i. max., outlet pressure range 70 to 150 p.s.i., high tensil iron body with Neoprene diaphragm material, Fischer No. 95H or approved equal. Down stream from the reducing valve, furnish a pressure gauge DeVilbiss No. GA-288 (max. pressure 160 p.s.i.) or approved equal.

(e) Laboratory Equipment:

1. Furnish rough-in and all final connections to the indicated specialized laboratory tables, fume hoods, sinks etc. Provide water, waste, gas and air piping as indicated. Provide valves on all lines (except waste); all traps and special output valves are furnished with or are a part of the equipment.

2. Provide all piping along desk tops for water, air and gas. Install the furnished valves. Install furnished lead traps and provide lead connections fom traps to Duriron waste system.

50-38. Demolition and Salvage:

(a) This contractor shall remove plumbing fixtures and piping in existing toilet indicated as Corridor A209. Rework piping to ceiling on pipe chase. Piping not removed shall be plugged, capped or otherwise terminated to prevent reuse. This will include hot, cold water, gas soil, waste and vent lines.

(b) Remove the exist hot water converter in Room A113. Remove steam and return lines. reconnect the main hot water supply line as indicated from this building Addition.

(c) All fixtures and materials removed shall be come the property of this contractor who shall remove them from the premises.

50-39. Completion and Testing:

(a) All parts of the plumbing system shall be made complete and perfect whether or not everthing is specifically mentioned.

(b) After all the work has been completed on each system, tests shall be made in the presence of the state architect or his representative.

(c) Open ends of cast iron and iron pipe work on drainage, waste and vent system shall be plugged or sealed and the system filled with water. If any leaks develop, they are to be repaired in best manner.

(d) In a like manner, all hot and cold water piping shall be subject to a hydrostatic pressure of 130# per square inch.

(e) While these pressures are being maintained, a thorough inspection will be made, and any parts showing leaks or defects shall be replaced or repaired by the contractor to the full satisfaction of the state architect or his representative. The state architect or his representative may, at any time order such changes as are, in his judgment, required for the proper operation of the systems, or to make them conform to the plans and specifications. Underground work must not be covered until fully tested.

(f) After all changes andpreparations have been made, a test shall again be made on the systems as outlined above, or on such parts of them as were not found satisfactory to the first test. Water necessary for these tests will be furnished by the owner. Pumps and compressors necessary to build up required pressures will be furnished by this contractor.

50-24. Guarantee:

(a) When all the apparatus herein specified, shown on drawings, or required for a complete system is furnished and installed, this contractor shall guarantee the installation to operate properly at all times, and to be free from defects for a period of one year. Such defects shall apply to faulty materials, design, or workmanship. In the event of the development of said defects, the contractor shall remedy the failure at his own expense within a reasonable time after notice.

60 - HEATING AND AIR CONDITIONING

60-1. General Conditions:

(a) General Conditions, sheets 1 to 8 inclusive, are a part of this specification and shall be consulted as to detail. Alternates on Sheets 2-9,2-10,&2-11 shall be consulted as to detail.

60-2. Scope of Work:

(a) The work covered by this division of the specifications consists of furnishing all labor, materials, and equipment, shown on the plans and herein specified to completely construct a system of Heating and Air Conditioning in "building project".

(b) All work shall be fully complete including major items of work and materials as follows:

(1) All steam and condensate return piping in utility tunnel to building.

(2) Building steam and condensate return piping, pressure reducing valves, etc.

(3) Building hot water and chilled water piping.

(4) All refrigerant piping systems.

(5) Air handling units, heating cooling unit ventilators, duct work, grilles, diffusers, dampers, and air intake louvers.

(6) Package chiller unit.

(7) Hot water convertor.

(8) Cooling tower.

(9) Condenser water pumps and chilled water pumps, condensate pump.

(10) Exhaust fans

(11) Controls.

(12) Insulation and painting.

60-3. General:

(a) The drawings indicate the extent and general arrangement of the Air Conditioning, Heating and Ventilation System. If any departures from the drawings are deemed necessary by the Contractor, details of such departures and reasons, therefore, shall be submitted as soon as practicable to the State Architect for approval. No such departures shall be made without the prior written approval of the State Architect.

(b) Each bidder shall visit the site and shall fully understand the extent of the work to be done and the conditions under which it must be accomplished.

60-4. Use of Premises:

(a) The Contractor shall confine his apparatus, storage of materials and the operations of his workmen to limits indicated by law, ordinances, permits or directions of the State Architect, and shall not encumber the premises with his materials. The Contractor shall not load or permit any part of the structure to be loaded with a weight that will endanger its safety. The Contractor shall enforce the instructions of the State Architect regarding signs, advertisements, fires and smoking.

60-5. Laying Out the Work:

(a) Thoroughly examine the drawings and specifications before commencing work. It is the duty of the Contractor to take his own measurements and be responsible for same.

60-6. Electric Current:

(a) The Electrical Contractor will run temporary electrical service to a pole adjacent to 'building project". The Mechanical Contractor will be responsible for providing his own electrical service from these points to locations as required. The Mechanical Contractor will be responsible for removing his own temporary service at the completion of the project.

(b) The electrical energy will be furnished to the project at no cost to the Contractors.

(c) Electric power will be available in 115/208 volts, 1 ø, AC, 60 cps, for small power tools, saws, threading machines, etc. Welding machines, large cranes, hoists, or heavy equipment or tools shall either be self-powered or be provided with power from other source.

60-7. Contractor to Clear Away Rubbish and to Protect Work:

(a) The Contractor shall clear away, from time to time, the dirt and rubbish resulting from his operations and shall cover and protect his work and materials from all damage by the elements, or from any other cause during the progress of the building and deliver the whole clean and in perfect condition.

60-8. Openings, Sleeves, Chases:

(a) The General Contractor will leave such openings and chases for pipes, cabinets, access doors, and equipment as may be necessary or directed by the State Architect to facilitate the working of the Mechanical Contractor and refinish around same; provided, however, that the Mechanical Contractor is on the job in due time to properly advise as to locations and sizes of such openings and chases. The Mechanical Contractor shall be responsible for locating and setting his own pipe sleeves in due time, and be well aware of the job progress to avoid unnecessary delay for setting of same.

(b) The General Contractor will leave the top off the utility tunnels as directed by the State Architect to allow the Mechanical Contractor to install piping and pipe supports, providing the Mechanical Contractor is on the job to eliminate unnecessary delays in completion of tunnel work.

60-9. Coordination of Work:

(a) The General Contractor will furnish all temporary heat until the building heating system can be placed in operation. It will be the responsibility of the Mechanical Contractor to place the buildings heating system in operation as soon as possible.

(b) As soon as the tunnel work by the General Contractor has progressed sufficiently to the building units, the Mechanical Contractor shall proceed with the steam and water services to the building as per service utilities drawings, to provide building with temporary and permanent heat and water as soon as possible. The General Contractor will provide for any temporary steam piping, and radiation required before building system can be put into operation.

(c) As soon as the building heating system, air handling units, piping, ductwork, etc., are installed and in running condition, the Mechanical Contractor shall utilize same for heating the building. The filters are to remain in the air handling systems and shall be cleaned and oiled or replaced before final acceptance. No portion of the system or any piece of equipment will be accepted before placing in operation for final acceptance. The guarantee period on all materials and equipment will not go into effect until the date of final acceptance. All equipment used for temporary heating

will be the responsibility of the Mechanical Contractor.

60-10. Electric Connections:

(a) The Electrical Contractor will provide the following work in connection with the heating and air conditioning work:

(1) Provide all wiring for the 1/4 HP unit ventilators, 120/60/1. Each unit shall be factory wired with built-in motor protection. Provide a 120 volt circuit from panel "D" to each unit.

(2) Provide all wiring for the fractional horsepower room units 120/60/1. Provide a 120 volt circuit from panel "D" to each unit.

(3) Furnish a disconnect switch and magnetic motor starter for each of the two hot-chilled water circulating pumps (3/4 and 5 HP, 208/60/3). Provide control wiring from P.E. switches.

(4) Provide disconnect switches and magnetic motor starters for the 1½ HP, 208/60/3 duplex condensate pump. Provide all power and control wiring.

(5) Furnish a power feeder and line connections to the control panel of the 75 HP, 480/60/3 chiller unit. Provide all conduit, flexible conduit and wiring for controls and interlocks between starters of circulating pump, condenser water pump, and control panel. The Electrical Contractor shall obtain a wiring diagram from the Mechanical Contractor and shall provide all control wiring as required. An increment type motor starter shall be provided by the Mechanical Contractor.

(6) Furnish a magnetic motor starter, a raintight disconnect switch and all wiring for the electrical installation of the 3.7 HP, 480/60/3 cooling tower fan. Provide interlock with condenser water pump.

(7) Furnish a magnetic motor starter, disconnect switch and all wiring for the 5 HP, 480/60/3 condenser water pump. Provide interlock with circulating pump as indicated via P.E. switch.

60-11. Permits:

(a) All licenses, permits, fees, etc. associated with the installation and connection of services, utilities and equipment furnished and installed under this section shall be paid for by the Mechanical Contractor.

60-12. Painting:

(a) All unfinished piping and radiators, electrical conduit, and panel boxes, and all factory primed and factory finished Mechanical and Electrical equipment in finished rooms and equipment rooms will be painted by the General Contractor after all tests have been made by the Mechanical and Electrical Contractors.

(b) All canvas covered pipe covering and insulated surfaces, shall be given a heavy coat of glue size. All canvas covered pipe covering and insulated surfaces furnished and installed under this section, in tunnels, equipment rooms, horizontal and vertical pipe chases, and all moist locations, shall be given a heavy coat of glue size, with a sufficient amount of fungicidal agent added to render the canvas mildew proof. Glue size and fungicidal agent shall be furnished and applied under this section by the Mechanical Contractor. Contractor shall add tint color to glue size for inspection purpose.

(c) All piping under this section in all equipment rooms, building tunnels, exterior service tunnels and in all exposed locations shall be identified by stenciled letters and words painted on 10 foot intervals.

(d) All steam, condensate return, hot and chilled water, and condenser water pipe covering in utility tunnel and building tunnels shall be given two coats of Pittsburg Paint Co. "Utility Grade" paint by the Mechanical Contractor.

(e) All pipe hangers, brackets and pipe supports in the tunnels shall be painted by this Contractor. The first coat shall be an application of "Rustarmor Red Primer, #401" followed by the application of two coats of light gray finish, "Rustarmor" Paint.

(f) The Contractor shall furnish paint in colors as selected by the State Architect's Office if not hereinbefore specified.

60-13. Installation of Equipment:

(a) All equipment under all sections of this specification shall be installed in accordance with the recommendations of the manufacturer and to the satisfaction of the State Architect.

60-14. Standard Products:

(a) All major items of mechanical equipment shall be of the best quality normally used for the purpose in good commercial practice and shall be the products of reputable manufacturers. Each major component of equipment shall have the manufacturer's name, address and catalog number on a name plate securely affixed in a conspicuous place. The name plate or a distributing agent only will

not be acceptable. All belts, pulleys, chains, gears, couplings, projecting set screws, keys and other rotating parts located so that any person may come in close proximity thereto, shall be fully enclosed or properly guarded.

(b) All material and equipment shall be new, of best quality and design, and free from defects. All material and equipment to be furnished under this specification shall be essentially the standard product of manufacturers regularly engaged in the production of such equipment and shall be of the manufacturer's latest standard design. Where two or more units of the same class of equipment are required, these units shall be products of a single manufacturer; however, the component parts of the equipment need not be products of the same manufacturer.

(c) The manufacturer and model numbers listed in these specifications or scheduled on the drawings, establishes type and quality. Where two or more manufacturer's equipment are specified for the same type of equipment, the Mechanical Contractor shall submit one manufacturer's equipment only for approval. All equipment of the same type shall be of the same manufacturer.

(d) Defective equipment, or equipment damaged in the course of installation or test, shall be replaced or repaired in a manner meeting the approval of the State Architect.

(e) Materials, such as adhesive, plastic insulation, glue size, fungicidal agents, insulation materials, etc , shall be delivered on the job in the original labeled containers.

(f) As soon as practicable, and within 30 days after the date of award of contract and before any materials or equipment are purchased, the Contractor shall submit to the State Architect for approval, a complete list, in five copies, of materials and equipment to be incorporated in the work. The list shall include catalogs, cuts, diagrams, drawings and such other descriptive data as may be required by the State Architect. No consideration will be given to partial lists submitted from time to time. Approval by the State Architect of materials and equipment will be based on manufacturer's published ratings and any material and equipment listed which are not in strict accordance with the specification requirements will be rejected.

(g) If the Contractor fails to submit for approval within the specified time, a list of materials and equipment in accordance with the preceding paragraph, the State Architect will select a complete line of materials and equipment. The selection thus made by the State Architect shall be final and binding and the items shall be furnished by the Contractor without change in the contract price or the time of completion.

60-15. Piping, Fittings, and Material Specifications:

(a) Black or galvanized steel pipe shall conform to Standard Specifications for Black and Hot-dipped Zinc Coated (Galvanized) Welded and Seamless Steel Pipe-ASTM Designation: A120-47. Each length of pipe shall be stamped with the makers' name or trademark. All pipe for use with welding fittings shall have welding ends beveled to A.S.A. Standards. Pipe 4" and smaller shall be butt-weld; pipe 6" and larger shall be seamless.

(b) Wrought-iron pipe shall be as manufactured by Byers, or approved equal, and shall conform to the Tentative Specifications for Welded Wrought-Iron Pipe - ASTM Designation: A72-52T.

(c) Copper piping shall be type L/labeled ACR seamless, hard drawn, and shall conform to Standard Specifications for Seamless Copper Water Tube - ASTM Designation B88-51. Fittings shall be cast bronze or wrought copper solder fittings with 45% silver solder and silver solder flux for refrigeration piping and 50-50 solder for water and drain piping.

(d) Fittings - All changes in direction shall be made with fittings.

(1) All fittings for welded piping shall be steel welding long radius ells, welding tees, welding reducers, welding neck and slip-on flanges, and weld-o-lets as specified under welding. Shaped nipples in lieu of weld-o-lets will not be acceptable. All welding fittings for use with wrought iron pipe shall be wrought-iron fittings. Welding ells, tees, and reducers shall conform to ASTM Specifications A-234-52AT, Schedule 40. Welding flanges shall conform to ASTM Specifications A-181. Flanges used on piping with pressures up to 125# shall be 150# working press. Flanges used on piping with pressures above 125# shall be 300# working pressure.

(2) All fittings for use with screwed pipe shall be best quality cast iron screwed fittings working pressure 125# or 250# as required, and shall conform to ASA B16d - 1941 specifications.

(3) Standard weight ground joint unions shall be used instead of right and left couplings and nipples where pipes are joined together.

(e) All flanged joints shall be faced true, packed and made up perfectly square and tight. Gaskets for flanged connections shall be Crane, or equal, Cranite 150# and 300# ring gasket - 1/16" thickness.

(f) All valves shall be best quality, full weight Crane, Mueller, Jenkins, Walworth, or approved equal, as hereinafter specified under "Valves". Valves shall be used in all places where

valves are specified or indicated on the drawings, unless otherwise called for. Valves not specified or indicated, but required for proper operation of the piping systems, shall be furnished and installed by this Contractor.

60-16. Exterior Utility Tunnel Piping:

(a) Exterior utility tunnel work covered by this section of the specifications shall be fully complete as shown on the drawings and herein specified including major items of work and materials as follows: The 25 psi steam line and pumped return shall extend to existing mains in utility tunnel serving existing Library Building.

(1) Furnish and install all steam and condensate return, piping as shown on the utility tunnel piping plans and specified under the Heating and Air Conditioning Specifications.

(2) Insulate piping as specified under the insulation section of the specifications.

(3) Furnish and install all pipe supports, expansion joints, guides and anchors as shown on the drawings, scheduled on drawings, and as specified.

(4) Furnish and install PRV with pilots, strainer, valves, gauges, by-pass, and allied equipment.

(5) Furnish and install drip traps and valves as shown, required and as specified.

(6) Paint pipe covering, piping and supports as specified under the "Painting" section of the specification.

(7) Air line shall be installed as specified under the "Controls" section of the specifications.

(b) Expansion joints in all steam lines in tunnels shall be Yarway, or approved equal, Fig. 6239 and 6241, gun-pakt, welding ends, 300 psi - 500 deg. F. Single end joints shall be furnished without base, and double shall have base.

(c) Expansion joints in all condensate return lines in tunnels shall be Joseph Kopperman & Sons, Type J-123 and J-123A or approved equal. These joints shall be high pressure 300 psi, stainless steel bellows, steel body with welding ends. Single end joints shall be furnished without base and double shall have base.

(d) Furnish and install pressure reducing valve as shown on the plans and as hereinafter specified. PRV shall be Spence type ED,

or approved equal, single seat. The above valve shall have bronze diaphragm, Seco metal seat ring and discs, stainless steel stem, carbon steel main spring and bolting.

(e) Pipe guides on condensate return lines shall be Elcen Fig. 511 Pipe Alignment Guides or approved equal. These guides shall be located four pipe diameters on each side of the expansion joints, at intervals of 100 feet, and where shown on the drawings. Anchors shall take the place of a guide.

(f) Pipe guides on all steam shall be constructed of four saddles and four rollers, (one pipe on top, one on bottom and one on each side of the pipe). These guides shall be spaced four pipe diameters each side of the expansion joints, at 200 foot intervals, and as shown on the drawings. Anchors shall take the place of a guide.

(g) Piping, valves, insulation, painting, pipe supports, and testing for tunnel work is covered elsewhere in these specifications.

60-17. Building Steam Supply and Return Mains:

(a) The low pressure steam main, sized as shown on the drawings, shall start at the point where the building service tunnel enters the building, thence to the building heating system, as shown on the drawings.

(b) The low pressure condensate return mains shall start with the building heating system to which it is connected thence to the condensate return pump as shown on the drawings.

(c) The pump discharge condensate return main, sized as shown on the drawings, shall start with the condensate pump and extend to where the building service tunnel enters the building.

(d) Piping under this section shall be insulated as hereinafter specified.

60-18. Steam Supply and Condensate Return Piping Erection:

(a) All steam supply piping shall be black steel schedule 40 piping with welding fittings for welded piping and cast iron screwed fittings 125# or 250# for screwed piping as hereinbefore specified under "Piping, Fittings & Materials". Welded piping shall be as hereinafter specified under "Welding".

(b) All condensate return piping shall be black wrought-iron schedule 40 piping with wrought-iron welding fittings for welded piping and cast iron screwed fittings 125# or 250#, as required, for

screwed piping as hereinbefore specified under "Piping, Fittings and Materials". Welded piping shall be as hereinafter specified under "Welding".

(c) The steam supply system is to consist of supply mains with supply risers, branches and runouts.

(d) Where changes in direction occur in the steam main supply lines, they shall be provided with swinging connections to allow for expansion and contraction of pipes.

(e) All horizontal steam supply lines shall be installed so as to pitch downward about 1 inch in 20 feet in the direction of the flow, and shall be evenly graded.

(f) The condensate return systems shall consist of return mains to be carried as shown, into which shall be connected all of the return risers and all condensation drips from the heating system. The return mains shall be evenly graded and be made to pitch downward about 1 inch in 20 feet in the direction of the flow.

(g) Where necessary to make a vertical rise, or pocket, in the condensate return mains in order to obtain the proper pitch, this shall be accomplished by use of an approved lift fitting.

(h) Webster, Dunham, Trane, Hoffman, or approved equal traps as called for in these specifications are to be placed in the ends of supply mains and risers as shown to properly drip them into the return mains. Specialties of the same manufacturer shall be used for radiator valves, traps, etc., throughout the building.

(i) Pockets must be avoided in the supply lines. If it is necessary for them to occur in the condensate return lines, they must be taken care of by means of lift fittings, as specified above. Bushings are not to be used where reductions are made in the size of the pipe lines. In all horizontal steam supply piping, eccentric reducers are to be used with opening turned down.

(j) All pipe shall be cut accurately to measurements established at the building, and shall be worked into place without springing or forcing, properly clearing all windows, doors and other openings. Cutting or weakening of the building structure to facilitate pipe installation will not be permitted. All pipes must have burrs removed by reaming and shall be installed so as to permit free expansion and contraction without damage to joints or hangers. Bent pipe showing kinks, wrinkles or other malformations shall not be acceptable. Pipe connections to equipment shall be in accordance with details shown on the drawings or as directed by the State Architect. All open ends of pipe lines or equipment shall be properly capped or plugged during installation to keep dirt or foreign material

out of the system. All pipe, not otherwise specified, shall be uncoated.

(k) All piping shall be properly supported by means of metal hangers as hereinafter specified. These hangers shall be spaced so as to prevent all sagging and vibration: not more than 10 feet apart, and be so designed as to provide for expansion.

(l) All connections required for equipment shall be provided by the Contractor unless shown on the drawings. Connections shall be made with malleable iron unions or steel flanges as required. All valves and traps shall be installed in accordance with the manufacturer's recommendations and as shown on the drawings, in a manner acceptable to the State Architect.

(m) All connections shall be carefully made to insure unrestricted circulation, eliminate air pockets, and permit the complete drainage of the system.

(n) All pipes passing through masonry construction shall be fitted with sleeves. Each sleeve shall be cut flush with each surface unless otherwise required. Unless otherwise specified sleeves shall be 2 pipe sizes larger in diameter than the passing pipe when uncovered and one pipe size larger in diameter than the overall outside diameter of the pipe when insulated. Sleeves in bearing walls shall be made of steel pipe. Sleeves in other masonry walls and in floors except floor in toilets, bathrooms and kitchens shall be 20 gauge galvanized sheet metal. Sleeves in floors of toilets, bathrooms and kitchens shall be wrought iron. Space between such floor sleeves and passing pipe shall be caulked with graphite packing and plastic and waterproof caulking compound. The floor sleeves shall extend one inch above the finished floor. All sleeves shall be properly installed and securely cemented in place.

(o) All pipes passing through the floors, walls or ceilings of finished rooms shall be fitted with chrome plated floor, wall or ceiling plates of standard patterns.

60-19. Hot Water - Chilled Water, Condenser Water and Condensate Drain Piping:

(a) The hot water - chilled water building supply and return piping shall start with water chiller unit and pumps thence throughout building to unit ventilators and room unit air conditioners and returning to chiller, as shown on the drawings.

(b) The condenser water supply and return piping shall start with condenser and pump thence to cooling tower and returning to condenser, as shown on the drawings.

(c) Condensate drains shall run from drain pan in Air Handling units to floor drains.

(d) Piping under this section shall be insulated as hereinafter specified.

60-20. Hot Water-Chilled Water, Condenser Water and Condensate Drain Piping Erection:

(a) Hot water-chilled water supply and return piping shall be black steel schedule 40 piping with welding fittings for welded piping and cast iron screwed fittings 125# for screwed piping as hereinbefore specified under "Piping, Fittings and Materials". Welded piping shall be as hereinafter specified under "Welding".

(b) Condenser water supply and return piping shall be black steel schedule 40 piping and hereinbefore specified for hot-chilled water piping. Underground pipe shall be given a heavy coat of cold tar mopped on.

(c) Condensate drain piping shall be Type K copper as hereinbefore specified under "Piping, Fittings and Materials".

(d) All piping shall be cut accurately to measurements taken on the job. Install offset connections for alignment of vertical to horizontal piping and where required to make a true connection. Bent or sprung pipe will not be accepted. Make branch connections with offsets to provide for expansion. Anchor piping at mid-points of long runs to provide expansion in each direction or in direction of piping offsets to allow for expansion. Expansion joints will be shown in long runs that cannot be absorbed by normal building piping offsets. Furnish and install approved pipe anchors where shown or required. Vertical piping shall be installed plumb. Horizontal piping shall be installed parallel to building walls and partitions.

(e) All pipe shall be worked into place without springing or forcing. Cutting or other weakening of the building structure to facilitate pipe installation will not be permitted. All pipes shall have burrs removed by reaming and shall be installed so as to permit free expansion and contraction without damage to joints or hangers. Bent pipe showing kinks, wrinkles, or other malformations will not be acceptable. Cap or plug all open ends of pipes during installation to keep out dirt or foreign material.

(f) All supply mains shall be evenly graded and shall pitch upward at least 1" in 40 feet in the direction of flow. All return mains and condensate drain mains shall pitch downward in the direction of flow for drainage purposes. Branch runouts shall pitch at least 1" in 20 feet. Eccentric reducers shall be used for all reductions in pipe size on supply and return mains. Bushings shall not be used for reduction of pipe size. All connections shall be

carefully made to insure unrestricted circulation, eliminate air pockets, and permit complete drainage of the system.

(g) Furnish and install air vents at highest points in hot-chilled water supply and return system and elsewhere as required where air may be trapped. Install air vent on the vertical rise in the supply and return piping from each Air Handling Unit. Air vents shall be Hoffman No. 78, or equal, high pressure automatic vent. Furnish and install copper overflow piping from vent to nearest floor drain. Provide 1/8" loose key type manual air vents for each unit ventilator and room unit air conditioner.

(h) Install eccentric reducers in a manner such that the tops of the pipe are kept in line in order to permit free passage of air along the pipe.

(i) Piping under this section shall be insulated as hereinafter specified.

(j) All pipes passing through the floors, walls, or ceilings of finished rooms shall be fitted with chrome plated floor, wall, or ceiling plates of standard pattern.

60-21. Make-Up Water Piping:

(a) This Contractor shall furnish and install make-up water to all systems requiring same installed under this section including cooling towers, and hot-chilled water building water systems.

(b) Furnish and install a pressure regulator, check valve, and gate valve on the make-up water supply to building hot-chilled water systems.

60-22. Air Conditioning Package Water Chiller Unit:

(a) Furnish and install where shown on the drawings a Trane model GB75B reciprocating cold generator, or approved equal, package water chiller unit as manufactured by Carrier Corp , American Blower Co., or Dunham-Bush. The unit shall have a minimum capacity of 75. tons, cooling 225 GPM of water from 53 degrees F. to 43 degrees F. when supplied with 239 GPM of 85 degree F. condenser water. The pressure drop shall not exceed 16 feet of water through the chiller and 15 feet of water through the condenser. The condensing temperature shall not exceed 105 degrees F. based on .005 fouling factor.

(b) The compressor shall be of the accessible hermetic type with 75 H.P., 1750 RPM, 480/60/3 motor. The compressor shall start unloaded and shall have four stages of capacity modulation not considering the off cycle. The compressor shall have forced feed lubrication utilizing positive feed reversible oil pumps. Unit shall be suitable for F 22 refrigerant. Motor shall be suitable for opera-

tion on 480/60/3 current.

(c) The unit shall be complete with compressor, insulated chiller, and shall include a dual pressure controller, non-cycling relay for pump-down, a differential oil pressure controller, expansion valves, solenoid refrigerant valves, safety thermostat, pneumatic modulating type temperature controller, vibration isolators, pressure relief valve, hot gas muffler, sight glass, and liquid line strainer. The unit shall include a control panel mounted on it which shall house the controls, terminal strip, on-off switch, gauges (high, low, and oil pressure), and increment type motor starter. The unit shall be factory assembled, and shall include a shell and straight tube condenser with removable end boxes.

(d) The pneumatic controller shall control the compressor by sensing the chilled water return temperature to provide step unloading and reduced motor input at partial loads. The controls shall be factory assumbled and the control panel mounted on the unit.

(e) The Heating and Air Conditioning Contractor shall set the cold generator on a suitably reinforced concrete pad.

(f) The compressor manufacturer shall furnish a factory trained service engineer to supervise the testing, charging, starting and Owner instruction.

(g) Electrical power wiring and interlock control wiring for the condenser water pump and cooling tower fan will be brought to the control panel by the Electrical Contractor. The Heating and Air Conditioning Contractor shall furnish complete wiring diagrams. One framed wiring diagram shall be mounted in the Equipment Room.

60-23. Room Unit Air Conditioners:

(a) Furnish and install room units of types and capacities as scheduled on the drawings. Units shall be furnished complete with 18 gauge bonderized steel insulated casings with baked enamel finish, non-ferrous coils, drain pan extension, double width double inlet fans direct connected to motor, 3-speed motor with built-in thermal overload protection and detachable cord, 3-speed motor control and permanent cleanable type filters.

(b) Unit coils shall be field reversible, completely drainable, and shall have manual air vents. End boxes shall be of adequate size to provide for piping connections without pipes passing through drain pan extension. Filters shall be removable from front without removing front panel. Pressure drop through coil shall not exceed 6 ft. water column.

(c) Units shall be Trane Model DD Unitrane, or approved equal, vertical floor mounted cabinet type room air conditioners.

60-24. Heating-Cooling Unit Ventilators:

(a) Furnish and install where shown on the Plans, non-recessed type unit ventilators. Unit ventilators shall be 30" high of sizes and capacities as scheduled on Plans.

(b) Furnish complete with two or more double inlet centrifugal fans mounted on a common shaft, direct connected motor, cleanable filters, 14 ga. furniture steel cabinets, removable access panels, heating element with non-ferrous fins mechanically bonded to non-ferrous tubes, aluminum wall boxes with weather louvers and lattice grilles, back draft damper, fresh air and return air damper with bronze bearings, two speed fan motor control and bonderized factory prime coat and baked enamel in color selected by the Architect.

(c) Unit ventilators shall be combination heating and cooling units suitable for hot or chilled water and shall be furnished with face and by-pass dampers and drain pan. Units shall be as manufactured by Herman Nelson, Nesbitt or Trane Co.

(d) Unit ventilators shall be arranged for type "Z" control as shown on temperature control diagram. The unit ventilator manufacturer shall install and connect electric pneumatic relay and damper motors specified elsewhere.

60-25. Building Hot Water Convertors:

(a) The hot water convertor shall be furnished and installed as shown on the drawings, and as herein specified. Convertor shall be installed complete with control valves, strainers, by-pass, angle iron support, thermometers, etc., as shown on the details.

(b) The hot water convertor shall be Bell & Gossett, or approved equal. Convertor shall be 2-pass, horizontal water tube U-bend, removable tube bundle, and shall have a capacity to heat 240 GPM water from 160 degrees F. to 180 degrees F. with 5 psi steam pressure. Pressure drop shall not exceed 5 feet.

(c) The convertor shall have cast-iron head, steel shell, steel tube sheet, 3/4" OD 18 BWG copper tubing, steel tube supports, steel bolts, ASME code constructed and stamped for 125# working pressure and 250# test pressure for 10" shell diameter unfired pressure vessel.

(d) Pneumatic controls shall be installed as shown on the control diagram.

(e) Convertor shall be insulated as hereinafter specified.

60-26. Hot Water Storage Heater:

(a) This Contractor shall furnish and install steam piping, valves, controls, strainers, traps, etc. to hot water storage heater as shown on the drawings, details and scheduled.

(b) Hot water storage tanks are specified under the Plumbing Section.

60-27. Cooling Tower:

(a) Furnish and install a Marley Model 5775 Permatower, or approved equal, double flow induced draft cooling tower with vertical discharge. Tower shall have a capacity to cool 252 GPM water from 95 degrees F. to 85 degrees F. based on 78 degrees F. wet bulb temperature.

(b) Tower basin, casing and top cover shall be constructed of wood panels laminated with water-proof adhesive and coated on both interior and exterior surfaces with a protective layer of resin impregnated fiber. Furnish with hot dipped galvanized air inlet screens.

(c) Tower shall have a gravity distribution system with upper basin constructed of pressure treated laminated wood and drilled to permit gravity flow over diffusion decks and filling. Wood filling shall be nailess design. Drift eliminators shall provide positive drift control.

(d) Fan shall be multiblade type, cast aluminum, adjustable pitch "V" belt driven with heavy duty grease packed flanged cartridge bearings bolted to a heavy formed steel support. Fan shaft shall be stainless steel. All steel components shall be hot dip galvanized after fabrication. Motor shall be 3.7 H.P. 480/60/3.

(e) Concrete base for tower will be provided by the General Contractor. Magnetic motor starter will be provided by the Electrical Contractor.

60-28. Hot-Chilled Water and Condenser Water Pumps:

(a) Furnish and install hot-chilled water pumps, and condenser water pump as shown on the drawings, details, herein specified, with capacities as scheduled.

(b) Pumps shall be close-coupled centrifugal vertical splitcase pumps with mechanical seal. Pumps shall be Bell & Gossett Series 1531-Type B 1750 RPM, or approved equal.

(c) Furnish and install all valves, thermometers, pressure gauges, flexible coupling, etc. as shown on the drawings and hereinafter specified.

(d) This Contractor shall furnish and install all pumps on 4" concrete base.

(e) Magnetic motor starter will be furnished and installed by the Electrical Contractor.

60-29. Flexible Couplings:

(a) This Contractor shall furnish and install flexible couplings in all locations as shown on the drawings and details.

(b) Flexible connections for condenser water and hot-chilled water piping shall be Goodall, or equal, "New Type" suction and discharge with hose couplings, or standard spool type with flanged ends.

60-30. Condensate Pumps:

(a) This Contractor shall furnish and install duplex condensate pumps in locations shown on the drawings, as shown on details, and with capacities as hereinafter specified.

(b) The duplex condensate pump shall be Dunham CHD 1040 E, or approved equal, 40 pound discharge bronze fitted, enclosed impeller centrifugal pump with a mechanical seal, welded copper-bearing steel tank, motor and float switches, 1750 RPM, alternator. Motors shall be 1½ H.P., 208/60/3. Unit shall be rated at 10,000 sq. ft. E.D.R.

(c) Mount pump in pit provided by the General Contractor.

(d) Magnetic motor starters will be furnished and installed by the Electrical Contractor.

(e) Contractor shall connect vent piping from condensate receiver into relief vent piping to atmosphere.

60-31. Flash Tank:

(a) Contractor shall furnish and install flash tank and base as shown on the drawings. Flash tank shall be Dunham-Bush, or equal, with valves, traps, vents, etc. and capacity as scheduled and detailed on the drawings. Install on 4" concrete base.

60-32. Hot Water Specialties:

(a) Furnish and install the following hot water specialties as manufactured by Bell & Gossett Co., or approved equal, where indicated on the drawings:

3 - 40 gal. expansion tanks with gauge glasses
1 - 4" ABF-S04 Airtrol boiler fitting
3 - ATF-12 Airtrol tank fittings
1 - S4" flow control valve
2 - #1050 Relief valves (Convertor)
1 - #175 Relief Valve (Chiller)
1/8" Loose key type manual air vents as required.

(b) Compression tanks shall be ASME code constructed and stamped. Provide stand for tanks as detailed on the drawings.

60-33. Pressure Reducing Valve Assemblies:

(a) This Contractor shall furnish and install all pressure reducing valve stations as shown on the drawing, details and with capacities as hereinafter specified.

(b) Pressure reducing valves shall be 4" Spence, or approved equal, and shall include 3 valve by-pass, reducers, pressure gauges, safety relief valves, and strainers. The pressure reducing valve shall have a minimum capacity of 4000 lbs. per hour based on 25 psi steam entering and 5 psi reduced pressure.

(c) Safety relief valves shall conform to the requirements of the American Society of Mechanical Engineers Boiler Construction Code. Safety valves shall be 4" consolidated type 1411L, or approved equal and shall have a minimum capacity of 4500 lbs. per hour at 15 psi set pressure. The Contractor shall furnish and install a consolidated discharge elbow and drip pan unit Type 1665 or approved equal. Install relief vents thru roof as shown on the drawings. The vent shall be supported so that it will not induce strain on the safety valves. Pipe a drain line from each safety valve drip pan unit to nearest floor drain.

60-34. Temperature Gauges:

(a) Furnish and install thermometers on piping as shown on the drawings, details and herein specified.

(b) Thermometers shall be "American" Industrial Glass Thermometers #7-206F, or approved equal, with 90 degree Back Angle Form, 7" scale, and 3-1/2" stem length and socket.

60-35. Pressure Gauges:

(a) Steam and water pressure gauges shall be furnished and installed where shown on the drawings and details. All pressure gauges shall be Ashcroft #1010 Quality Gauge, 4 1/2" dial size, as manufactured by Manning, Maxwell and Moors, U. S. Gauge Co. or approved equal. Furnish compound gauges on pump inlets. Furnish syphons on steam gauges and gauge cocks on all gauges.

60-36. Return Traps:

(a) Thermostatic traps shall be installed in the return connection from radiation and elsewhere as indicated on the drawings. The size and capacity of the traps shall be as indicated on the drawings but in no case, less than 200 sq. ft. of equivalent direct radiation. The capacity of all traps shall be based on a pressure differential of 2 lbs. per square inch. The traps shall be of the straight through or angle pattern with double union connections, the trap bodies and covers shall be of brass and shall have removable thermostatic members. The traps shall automatically pass all air and condensation from radiators and close tightly to steam. The traps shall be designed for steam working pressures up to 15 pounds per square inch gauge. These traps shall be as manufactured by Sarco, Trane, Dunham, or approved equal.

(b) Float and thermostatic traps shall be installed in the return connection of low pressure mains, and elsewhere as indicated on the drawings. The size and capacity of these traps shall be ample for the unit as indicated on the drawings, but in no case less than 200 pounds of condensate per hour. These traps shall be designed for steam working pressures up to 15 pounds per square inch gauge. Each float and thermostatic trap shall be provided with hard bronze valve seat and mechanism and brass float, all of which can be easily removed for inspection or replacement without disturbing the piping connections. The inlet to each trap shall have a brass strainer as an integral or separate part of the trap.

(c) Bucket traps shall be furnished and installed in medium and high pressure steam main drips and elsewhere as indicated on the drawings. These traps shall be designed for working pressures up to 150 pounds per square inch gauge and shall be tested hydrostatically and proved tight under a gauge pressure of 200 pounds per square inch. Each trap shall have a heavy body and cap of fine-grained gray cast-iron. The bucket shall be made of brass or other acceptable material, and the mechanism shall be of hard bronze. The valve and seat shall be constructed of corrosion-resistant metal. The traps shall have ample capacities for the units indicated on the drawings, but in no case less than 200 pounds of condensate per hour when operating under the specified working conditions. A strainer shall be installed in the inlet connection of each trap. These traps shall be as manufactured by Sarco, Trane, Dunham, or approved equal. Bucket traps on steam mains with pressure above 150 pounds shall be designed for working pressure of 250 psi.

(d) The ends of all steam mains, or any point where condensate may accumulate because of a change in elevation or grade of the steam mains, shall be dripped to the dry return main though not specifically shown on the Plans. Traps shall be as manufactured by Sarco, Trane, Dunham, or approved equal.

60-37. Strainers:

(a) Basket or "Y" type strainers shall be the same size as the pipe line in which they are installed. The bodies shall have arrows clearly cast on the sides to indicate direction of flow. Each strainer shall be equipped with an easily removable cover and sediment basket. The strainer bodies shall be heavy, durable and of the best grade gray cast iron, with bottoms drilled and plugged. The basket shall be of not less than 0.025 inch thick (22 gauge) sheet brass, having perforations to provide a net free area through the basket of at least four times that of the entering pipe. The flow shall be into the basket and out through the perforations.

60-38. Pipe Sleeves, Hangers and Supports:

(a) Pipe sleeves, hangers, and supports shall be furnished and set by this Contractor, and this Contractor shall be responsible for their proper and permanent location. Pipe shall not be permitted to pass thru footings, beams, or columns.

(b) Pipe sleeves shall be installed and properly secured in place at all points where pipes pass thru masonry on concrete, except through unframed floor on earth unless otherwise noted. Pipe sleeves shall be of a sufficient diameter to provide approximately 1/4" clearance around the pipe, and in the case of insulated pipe approximately 1/4" clearance around the insulation. Pipe sleeves in walls and partitions shall be of wrought iron or steel pipe. Pipe sleeves in bearing walls shall be of cast wrought iron or steel pipe. Pipe sleeves in floors and non-bearing walls shall be 18 gauge galvanized sheet metal.

(c) Hangers, supports, and anchors shall be installed as shown on the Plans or in the specifications, and as required to obtain a safe, reliable, and complete piping installation. Where not shown on the Plans or listed in the specifications, hangers shall be provided for approximately every 10 feet of pipe; however, in any case, a sufficient number shall be provided so that the deflection of pipe between hangers does not exceed 1/4 inch. All supports shall be properly leveled and anchored when installed. Anchors shall be placed so that thermal expansion will be absorbed by bends without imposing strains on valves or equipment. All lines in which varying flow conditions produce whipping shall be provided with sway bracing or special corrective hangers. The spring strength and range of travel on spring hangers shall be such that, when the full piping load is placed on the hanger under normal operation, the remaining spring travel is not less than 1/2 inch. All lugs, ears, or other attachments welded to the piping shall be of the same material as the pipe. Protection saddles shall be tack welded to the piping.

(d) All horizontal runs of pipes shall be supported from the floor or beam construction by means of steel rods and hangers. Hangers for pipe sizes up to and including 6" shall be malleable split ring pipe hanger and turnbuckle adjuster, Elcen Figure 10C, or approved equal. Hangers for pipe sizes larger than 6" shall be steel double bolt pipe clamp type Elcen Figure 3 with turnbuckle. Hanger shall be supplied with rods and rod support as required for supporting construction.

(e) Hangers for use with copper piping shall be copper plated and sized for copper piping. The Contractor shall use same equivalent hanger as specified above.

(f) All vertical runs of piping shall be securely supported at the floors or ceiling thru which they pass. Supports shall be Elcen Figure 39, or approved equal. Supports shall be copper plated for use with copper piping.

(g) Concrete inserts for support of pipes 6" and smaller in multiple pipe runs in the Building Units shall be Elcen Figure 6000 galvanized with wax closure strip and end caps. Concrete inserts for pipes larger than 6" in either single or multiple runs, and for pipes smaller than 6" in single runs shall be Elcen Figure 65 and 65A or approved equal.

(h) Pipe covering protection saddles for use with insulation with vapor barrier covering shall be Elcen Figure 218 Type B, or approved equal.

(i) Pipe alignment guides shall be Elcen Figure 511, or approved equal.

(j) All exposed pipes passing thru floors, ceilings, or walls shall have chrome plated floor, ceiling, or wall plates of standard pattern.

(k) All piping shall be securely anchored at points shown on the drawings and as required for expansion and proper operation of the system. Anchors in utility tunnels shall be furnished and set in place by the Mechanical Contractor as detailed on the drawings. The General Contractor will pour these anchors in the tunnel construction.

(l) Piping systems in tunnels shall be supported by rigid hangers and rods. All piping in these tunnels shall be supported by Elcen concrete strip inserts. Hanger and inserts shall be as hereinbefore specified For the supporting of pipes by pipes directly above the other, the top pipe hanger shall be Elcen Fig.10C with turnbuckle, or equal. For pipes to be supported from the pipe above use Elcen Fig. 10B on supporting pipe and on pipe being

supported (one on each pipe). Chilled water and cold water pipe hangers shall be on the outside of the insulation with protective sleeve as detailed on the drawings, or insulate hanger rod for a distance of 12" up rod. All chilled water piping on pipe rollers and guides shall be installed with protection sleeves as detailed.

(m) All piping in tunnels shall be supported in locations shown and shall be supported at intervals not to exceed 11'-0" on centers.

(n) Painting shall be as specified under Painting.

60-39. Expansion Joints:

(a) This Contractor shall furnish and install all expansion joints in buildings and utility tunnels as herein specified.

(b) All expansion joints in utility tunnel steam lines shall be Yarway, or approved equal, gun-pakt, welding ends, 300 psi - 500 degree F. with single ends or double ends with base as scheduled on the drawings and hereinbefore specified under "Exterior Tunnel Piping".

(c) All expansion joints in condensate utility tunnel condensate return lines shall be Kopperman, or approved equal, flexible metal joints, 300 psi, stainless steel bellows, steel body with welding ends, single ends or double end with base, as scheduled and hereinbefore specified under "Exterior Tunnel Piping".

(d) Should expansion joints be required in the building units piping systems, expansion joints up to and including 3" in size shall be Flexon Model H, Robert Shaw - Fulton High Pressure Type, or approved equal, 150 pounds working pressure, two ply stainless steel bellows, positive anti-torque device, 1 3/4" compression, 1/4" extension, N.P.T. ends.

(e) Expansion joints in building unit piping systems 4" and larger shall be Flexon High Pressure Controlled Flex Joint Type 304, Kopperman, or approved equal, stainless steel pressure carrier, corrugations as required for proper expansion, nickel iron control rings and steel flanges, 150# rating.

(f) In all cases expansion joints and compensators are to be properly guided in accordance with manufacturer's recommendations and as hereinbefore specified.

60-40. Drains:

(a) A drain consisting of a hose bib or gate valve, as required, shall be installed at all low points in the systems and as shown on the drawings for convenient and thorough draining of the entire systems.

60-41. Welding:

(a) All joints between sections of pipe and between pipe and fittings on steam supply and return, and on hot water-chilled water piping and condenser water piping, 2" and larger shall be fusion welded. The welding shall be in accordance with the recommendations of the American Welding Society. Changes in direction and intersections of lines shall be made with welding fittings. Mitering of pipe to form elbows, notching straight runs to form tees, or any similar construction will not be permitted.

(b) Butt-welding tees shall be used in all butt-welded lines where the stub-out branch line size multiplied by two (2) is equal to or exceeds the size of the main run welded pipe line. Weld-o-lets shall be used where the stubout branch size multiplied by two (2) is less than the size of the main run welded pipe line.

(c) All welders engaged in work performed under this specification shall have been fully qualified in accordance with the test requirements of Section IX of the ASME Boiler Construction Code. Each Welder's Certificate of Qualification shall be on file at the site of work and shall be made available to the State Architect or his representative upon request. Valid certificates issued by recognized insurance companies attesting the qualifications of welders will be acceptable.

(d) The State Architect or his representative may require the Contractor to cut a coupon from any weld for testing. Any coupon cut and tested must have a tensile strength of at least 50,000 lbs. per sq. inches before weld breakage or rupture. In case of any coupon failure, the Contractor must cut out the entire weld and reweld. No additional charges will be allowed for any part of this work.

60-42. Valves:

(a) Valves shall be installed at the locations shown on the drawings, where specified, and where required for the proper functioning of the system as directed by the State Architect. All valves shall be installed with their stems or spindles above horizontal.

Valves in Building Piping Systems Shall be as Follows:

(b) Standard 125# steam brass screwed gate valves shall be used on lines 1 - 1/2" and smaller. Valves shall be Crane No. 428, Walworth, Jenkins or approved equal, with rising stem and solid wedge disc.

(c) Standard 125# iron-body brass trimmed flanged gate valves shall be used on lines 2" and larger. Valves shall be Crane No. 465-1/2, Walworth, Jenkins, or approved equal, O.S.&Y. with brass seat and brass stem.

(d) Standard 150# steam brass screwed globe valve shall be used on lines 1-1/2" and smaller. Valves shall be Crane No. 14-1/2 P., Walworth, Jenkins, or approved equal, with plug type disc and renewable body seat ring.

(e) Standard 200# steam iron-body brass trimmed flanged globe valve shall be used on lines 2" and larger. Valves shall be Crane No.351, Walworth, Jenkins, or approved equal.

(f) Standard 125# steam screwed swing check valves shall be used on lines 1-1/2" and smaller. Valves shall be Crane No. 34, Walworth, Jenkins, or approved equal, with brass disc.

(g) Standard 125# steam flanged swing check valves shall be used on lines 2" and larger. Valves shall be Crane No 373, Walworth, Jenkins, or approved equal, with iron body and brass trim.

(h) Flow control valves (balancing valves) on main lines shall be Nordstrum #143, or equal, semi-steel lubricated plug valves for 175# working pressure, or approved equal.

Valves in Utility Tunnel Piping Systems Shall Be As Follows:

(i) Valves to be used in steam supply mains 4" and smaller shall be Nordstrum Fig. 305, 250# SWP semi-steel lubricated plug valve, or approved equal.

(j) Valves to be used in steam supply mains 6" and larger shall be Nordstrum Fig. 269, 250# SWP semi-steel lubricated plug valve, or approved equal.

(k) Valves to be used in condensate return mains shall be Nordstrum #143, 175# WOG semi-steel lubricated plug valve, or approved equal.

(l) All plug valves shall have the shipping lubricant replaced by the lubricant recommended by the valve manufacturer.

(m) Valves as specified shall be installed where called for on the Plans, and where required by the installation.

(n) A union shall be installed adjacent to all screwed valves and at other points where disconnection of the piping will be required. Where unions are installed, sized 1-1/2" and smaller shall be malleable iron, galvanized, brass to iron seat, ground joint screwed type, Crane No. 1280, Kewanee, Walworth, or approved equal. Unions on piping 2" and larger shall be flanged with gasket as hereinbefore specified.

60-43. Exhaust Fans:

(a) Furnish and install all exhaust fans as shown on the drawings, details, and type and capacity as scheduled on the drawings. Submittals shall be based on one manufacturer for same type fan.

(b) Exhaust fans shall be furnished with birdscreen, dampers and disconnect switches called for on the schedules. Roof exhauster curbs will be constructed by General Contractor. Should curb size for exhaust fan accepted differ from curb size of fan specified it will be the responsibility of this Contractor to notify the General Contractor of the change of size before roof slab is formed. This Contractor shall be responsible for checking and notifying General Contractor of any discrepancy in opening sizes for equipment he is to install under this section.

(c) Fume hood exhaust fans will be furnished under the equipment contract and mounted by the Heating and Air Conditioning Contractor. Provide 3/8" rod hangers and suspension type vibration mounts for fans.

60-44. Sheet Metal Work:

(a) Furnish and install all sheet metal work for all supply and return air duct systems, outside air, exhaust air, fume hood supply and exhaust systems, toilet room exhaust systems, etc. including supply registers and diffusers, return grilles and registers, volume control dampers, air turns, air intake, and all work required to make the job complete as shown on the drawings, details and herein specified.

(b) All ductwork shown on the drawings, specified or required for the systems shall be constructed and erected in a first class and workmanlike manner. Sheet metal shall be best grade prime open hearth galvanized sheet metal as manufactured by American Rolling Mills, Republic Steel Corporation, or approved equal.

(c) All gauges and reinforcing shall be in accordance with the following schedule for greatest dimension of duct or housing

Dimension	U.S. Standard Gauge	Reinforcing	Maximum Spacing
0" - 24"	24		
25" - 36"	22		
37" - 56"	20	1" x 1" x 1/8"	5' - 0"
57" - 72"	18	1-1/4" x 1-1/4" x 1/8"	5' - 0"
Over 72" & Housings	18	1-1/2" x 1-1/4" x 1/8"	4' - 0"

(d) Sheet metal ducts and housing shall be properly braced and reinforced with galvanized steel angles, or other structural

members approved by the State Architect. Reinforce ducts less than 16" in depth with angles on top and bottom only. Install additional reinforcing where necessary to eliminate excessive movement and vibration. The internal ends of all slip joints shall be installed in the direction of the flow. All panels shall be cross broken.

(e) Support ducts with 3/16" rods or strap iron hangers attached to bottom of ducts and to roof structure and bracing with toggle bolts, or other approved means. Space hangers not over 7'-0" o.c. Install hangers straight, and on uniform centers. All ducts shall be firmly supported in place with tight connections.

(f) Air turns shall be furnished and installed in all abrupt elbows, arranged so as to permit the air to make abrupt turns without appreciable turbulence. Air turns shall be the manufacturer's standard products and shall be free from vibration when system is in operation. Install square elbow turns for changes in direction unless shown. Volume air extractors shall be Titus, No. AG-45, or approved equal.

(g) Make required off-sets in ducts to clear pipes, beams and construction whether shown or not, if required by job conditions.

(h) Make joints in ductwork airtight and patch or solder open corners.

(i) Provide access panels for all concealed controls, motors, fans, dampers, thermostats, etc., and hinged access doors in all housings. Construct access panels in insulated ducts and housings same as access doors, except omit hinges and substitute catches.

(j) Provide flexible connections to join ductwork to suction and discharge of fan. Sixteen ounce canvas treated or impregnated to render airtight shall be used and shall be furnished with all necessary fastenings to make an air-tight connection. At no point shall the fan come in contact with any part of the ductwork or housing.

(l) Exhaust ducts between fume hood discharge and exhaust fan inlet shall be 26 gauge stainless steel. Air tight connections from hood and exhaust blower to connect to transite ducts as hereinafter specified. All joints in stainless steel ducts (both transverse and longitudinal) shall be welded.

(m) Exhaust ducts from outlet connection of fume hood exhaust fans shall be Transite industrial vent pipe and transite fittings as manufactured by Johns-Manville Co. Provide transite

cone top and Transite flashing coupling with copper roof flashing as detailed on the drawings. Joints shall be gas tight and shall be made with Transite flue pipe cement. Vertical risers shall be supported at 10 ft. intervals by means of 2" x 3/8" pipe anchors anchored to building structure.

60-45. Grilles and Registers:

(a) Furnish and install supply registers and diffusers, return air grilles, exhaust grilles, outside air intake penthouses, etc. as hereinafter specified. Set grilles with rubber gaskets for air tight connections with mounting surface.

(b) Furnish and install grilles and registers of type, size and capacity as shown on the drawings and hereinafter specified.

(c) Side-wall return and exhaust grilles shall be Titus #RL-230, or approved equal, 45 degree louver.

(d) Return grilles in stair risers (Rm A313) shall be lattice type, 10 gauge bronze. Provide a 90 deg break in top flange as required. Grilles shall be Tuttle and Bailey Design 570 or approved equal.

(e) Supply registers shall be Titus #L-277 or approved equal, four-way registers with key operated opposed blade dampers.

(f) All grilles and registers, except lattice grilles, shall be furnished in prime coat finish.

(g) Furnish Titus AG-45 or approved equal volume extractors behind all supply registers.

(h) Outside air intake louvers in outside walls shall be furnished by the Mechanical Contractor and set by the General Contractor. Louvers shall be constructed of 20 gauge galvanized sheet metal as detailed on the drawings.

(i) Gravity roof exhausters shall be Breidert type L with roof flashing as detailed on the drawings. Furnish with birdscreen.

(j) Provide relief gooseneck with roof curb where indicated on the drawings. Construct of 22 gauge galvanized sheet metal with curb mounting. Provide interior anchor straps to roof structure. Provide angle iron stiffener and galvanized birdscreen. Provide counter-balanced back draft damper with access door for adjusting damper.

60-46. Automatic Temperature Control:

(a) Furnish and install a pneumatic system of automatic temperature control as indicated on the drawings and as specified in the following paragraphs:

All thermostats, E.P. switches, diaphragm valves, damper motors, and piping shall be installed as required for a complete and operative temperature control system. The entire automatic control equipment shall be a standard, catalog product of a single, reputable manufacturer and shall be installed by the control manufacturer. All work shall be done by factory trained mechanics regularly employed by the control manufacturer. The complete control system shall be guaranteed for a period of one year after acceptance, including any service incidental to its proper performance.

Wiring for the air compressor and E.P. switches shall be by the electrical Contractor. Automatic valves shall be set in place by the Heating and Air Conditioning Contractor. Automatic dampers shall be set in place by the Sheet Metal Contractor.

(b) Air Piping. Run air piping from receiver to various valves, thermostats, etc. requiring compressed air. Air piping shall stand 30 pound air test for twenty-four (24) hours without any appreciable loss. Furnish and install automatic splash or ring-lubricated, enclosed air compressor with feed belt drive, 115-60 motor, automatic pressure switch, disconnect switch, pressure regulating valve, air gauges, and underwriters type relief valve. Compressor shall be tank mounted, resting on Korfund isolators.

The piping shall be carefully run with due regard to drainage and condensation, and with drip pockets wherever necessary. It shall be concealed from view in all finished areas. All piping shall be substantially supported with straps or hangers.

(c) Sequence of Operation.

1. Convertor Control - The temperature of the hot water leaving the convertor shall be maintained constant by a sub-master thermostat with its sensing bulb located in discharge of the convertor. This thermostat shall position a normally open steam valve supplying steam to convertor according to demand. Setting of the submaster thermostat shall be reset from an outdoor thermostat in an inverse ratio with outdoor temperature. Master thermostat bulb shall be located under a sunshield. Thermometer shall be installed indicating outdoor temperature and hot water temperature.

2. Hot Water Storage Heater - Storage water temperature shall be maintained constant by a remote bulb thermostat operating a normally closed steam valve on steam supply to heater.

3. Zone Summer-Winter Change Over - The various unit ventilators and room units throughout the building shall be divided into two (2) zones. Each zone shall be furnished with a summer-winter switch mounted on a suitable panel located in the Mechanical Equipment Room. Each switch shall position two (2) 3-way water valves allowing the system return water to flow through the convertor in the winter and through the chiller in the summer. During the summer operation, the air supplied to the summer-winter thermostat shall be maintained at 20 psi. During the winter, the air pressure to the zone summer-winter thermostat shall be at 15 psi. See drawing on Plans for schematic hookup.

4. Heating-Cooling Unit Ventilators - A summer-winter type thermostat shall maintain desired space temperature by positioning the face and bypass dampers, fresh air and return air dampers within the unit ventilators all in accordance with ASHRAE cycle "Z". An E.P. switch shall be provided to close fresh air damper when unit is not running. A low limit thermostat shall be provided to prevent discharge temperature from dropping below a predetermined point in the winter operation. During the summer, this low limit thermostat shall be switched out of the line. A pressure reducing valve shall be provided to maintain a predetermined minimum outdoor opening during the cooling season. The PRV will be inoperative during the heating season.

5. Room Unit Control - A summer-winter type thermostat shall maintain desired space temperature by positioning a normally open unit water valve. Season change-over for all summer-winter type thermostats shall be accomplished as described above under "Zone Summer-Winter Change Over".

(d) General.

1. All valve operators and damper operators shall be adequately sized to prevent fluttering. All automatic valves and damper operators remotely operated from controller shall be provided with air gauges to indicate their position. Duct thermometers shall be installed adjacent to all duct thermostats and also in the discharge of all zones. All necessary relays and other appurtenances necessary to obtain the above sequence of operation shall be considered a part of this specification.

2. A night thermostat shall be furnished and installed as directed and set at 60 degrees. This thermostat, when switched into the system, shall operate the unit ventilator fans intermittenly during the winter to maintain a reduced night temperature. An automatic time clock shall be furnished which will energize an E.P. switch at a predetermined time to allow night thermostat to function. A manual timer shall be furnished and installed in an accessable place which will override the clock for a maximum of three (3) hours and restore the daytime temperature. During the

summer, the clock and timer shall function to turn off fans, refrigeration equipment and cycle pumps. The manual timer will restore operation of this equipment for a maximum of three (3) hours. See Plans for schematic drawing. P.E. switch shall be provided in the summer-winter zone switch line which will prevent refrigeration compressor operation during the heating season and will maintain circulating pump operation during heating season.

60-47. Completion and Testing:

(a) The Contractor shall use all means to expedite completion of the work under this contract. He shall keep in touch with the progress of other construction work and shall so organize his work as to best cooperate with other contractors.

(b) All parts of each system of piping shall be made complete and in perfect condition whether or not all details are specifically mentioned. None but competent and experienced workmen shall be employed on the job.

(c) After all piping has been completed, tests on the system shall be made in the presence of the State Architect, or his representative. All heating pipes are to be subject to a hydrostatic pressure of 125 psi. Tests on the heating system shall be made before the installation of any radiation equipment or insulation. While these pressures are being maintained, a thorough inspection shall be made and any and all parts showing leaks or defects will be replaced or repaired to the full satisfaction of the State Architect or his superintendent.

(d) The State Architect or his superintendent may, at any time, order removal and replacing of defective parts and order such changes as are in his judgment necessary for the proper operation of the system, or to make them conform to the Plans and specifications.

(e) After such changes are made, another test shall be made on the system as described above or on such parts as were not found to be satisfactory in every respect.

(f) After the systems have been made tight and have been demonstrated as satisfactory to the State Architect or his representative, steam or water, as the case may be, is to be carried into the system and the system put in operation for the purpose of cleaning out all scale, dirt, oil, waste, and other foreign matter. The steam and water necessary for these tests shall be provided by the State. Pumps and compressors and connections necessary to build up required pressure will be furnished by this Contractor.

60-48. Pipe Covering and Insulation:

(a) Utility Tunnel Steam and Condensate Return Piping Insulation:

(1) The insulation for the 4" - 25# steam main in tunnel shall be 2" thickness 1200 deg. F. white rigid hydrous calcium silicate heat insulation. Pipe insulation shall have an average "K" factor not exceeding 0.50 BTU/sq.ft./inch/hour/degree F. at 500 deg. F. mean temperature.

(2) The insulation for all condensate return piping in utility tunnel shall be 1" high temperature insulation as specified for steam piping.

(3) All insulation under this section shall have 8 oz. canvas jacket neatly and securely pasted down. Insulation shall fit tight to pipe.

(4) All fittings, valve bodies, unions, flanges, and pipe hangers shall be insulated with a plastic-high temperature cement troweled smooth and covered with 8 oz. canvas, pulled tight and smooth and pasted down. Hanger rods and turnbuckles shall not be insulated.

(5) Canvas covering shall be sized with fugicidal addative and painted as specified under "Painting".

(b) Low Pressure Steam and Condensate Return Piping Insulation:

(1) All low pressure (15 psi) steam supply and condensate return lines, throughout the buildings, including chases and tunnels under the building, shall be covered with preformed, molded, sectional, bonded-glass-fiber pipe insulation. Pipe insulation shall be 1 inch thick, with an average "K" factor not exceeding 0.25/BTU/sq.ft./inch/hour/degree F. at 75 deg. F. mean temperature. Insulation shall have a standard weight, factory-applied, white canvas jacket. In applying, the canvas flap shall be loosened and the cylinder opened, then carefully fit the insulation to the pipe, so that the end to end and the longitudinal joints are tightly butted together to give heat-tight joints. Secure the flap with wheat paste and smooth out to give a neat and finished appearance. Stapling will not be permitted. Insulation shall fit tight to pipe. Provide expansion joints at 30 foot intervals in all continuous runs of pipe which have no side take-offs.

(2) All fittings, valve bodies, unions, flanges, and pipe hangers on all lines shall be insulated with a 3/4 inch layer of Eagle-Picher, or approved equal, "One Cote Cement", followed by a 1/2 inch layer of E-P No. 99, or approved equal, asbestos finishing cement. Both layers of insulating and finishing cement shall be

troweled to a smooth even finish and shaped to give a neat appearance. Finish with standard weight canvas pasted in place. Insulation shall have the same thermal characteristics as specified above for piping. Hanger rods and turnbuckle adjusters shall not be insulated.

(3) Where steam supply and condensate return piping occur in finished rooms and equipment rooms, the Contractor shall apply an additional finish cover of white 6 oz. canvas securely and neatly pasted on and sized for painting. All sizing and painting shall be as specified under "Painting". Finish cover of 6 oz. canvas shall be applied over all such pipe, fittings, valve bodies, flanges, etc.

(c) Hot Water - Chilled Water Piping Insulation:

(1) All hot water-chilled water piping (Building Air Conditioning Heating Systems) throughout the building, including chases, and pipe corridors, and tunnels underneath the building, shall be covered with preformed, molded, sectional, bonded-glass-fiber pipe insulation. Pipe insulation shall be dual temperature type, with an average "K" factor not exceeding 0.25/BTU/sq.ft./inch/hour/degree F. at 75 deg. F. mean temperature. Insulation shall have a factory applied integral white vapor barrier jacket. Laminated jacket shall have aluminum foil insert and shall have a vapor transmission rating of less than 0.01 perms. Insulation shall be 1-1/2 inch thick. In applying, the vapor barrier jacket flap shall be loosened. Coat the 2-1/2 inch flap of the jacket with vapor barrier adhesive, Rubber Adhesive Corp., Bondmaster YY12F, lap cement, or approved equal. Jacket flap shall be completely coated with adhesive. Open insulation cylinder and carefully fit the insulation to the pipe, so that the end to end and longitudinal joints are tightly butted together to give tight joints. Secure the jacket flap and smooth out to give a neat and finished appearance. Wrap 4 inch wide bands of vapor barrier jacket material, coated on one side with the above type of adhesive, tightly around each end joint and around the middle of each section of insulation. Stapling will not be permitted. Insulation shall fit tight to pipe. Provide seal-off joints at 45 foot intervals in all continuous runs of pipe which have no side take-offs.

(2) All fittings, valve bodies, unions, flanges, and pipe hangers shall be insulated with flexible, glass-fiber, blanket insulation wrapped firmly under compression (minimum 2 to 1) and held in place with spiral windings of jute twine. The end of pipe covering adjacent to the fitting shall be cut back about 1/2 the depth of the insulation. The first layer of the flexible blanket insulation shall be fitted tight to the end of the adjacent pipe covering. The second layer of the flexible blanket insulation shall cover both the first layer on the fitting and the exposed cut back ends of the adjacent pipe insulation making a continuous layer of material around the pipe and fitting. Blanket insulation shall then

be coated with vapor-barrier mastic, "Sealfas 30-36" Benj-Foster Co , or approved equal, lapped over and on to the adjacent pipe covering jacket to provide a continuous seal. Allow the mastic to set and then cover with 3/4 inch of Eagle-Picher, or approved equal, "One Cote Cement" troweled on. Cover the cement, while still plastic with standard weight canvas or glass fabric. Finish the fitting with a 1/2 inch layer of E-P 99, or approved equal, asbestos finishing cement troweled to a smooth even finish and shaped to give a neat appearance. After the final coat of cement has set, paint all fittings, including 2 inches of the adjacent pipe covering jacket on each side of the fitting, with a coat of Sealfas 30-36 to give a continuous and finished surface. Insulation shall have the same thermal characteristics as specified above for piping. This insulation shall also be applied upward along the vertical hanger rods to a point not less than 12 inches from the adjacent fitting finish and sealed off or pipe hanger may be installed around outside of weight bearing insulation and protection saddle as specified and detailed, and need not be insulated at Contractor's option.

(3) Where chilled water-hot water piping occur in finished rooms and equipment rooms, the Contractor shall apply an additional finish cover of white 6 oz. canvas, securely and neatly pasted on and sized for painting. All sizing and painting shall be as specified under "Painting". Finish cover of 6 oz canvas shall be applied over all such pipe, fittings, valve bodies, flanges,etc.

(d) Condensate Drain Piping Insulation:

(1) All condensate drain lines originating from drain pans under chilled water coils in all chilled water air handling units shall be covered with preformed, molded, sectional, bonded-glass-fiber pipe insulation. Pipe insulation shall be low pressure type, 1/2 inch thick, with an average "K" factor not exceeding 0.25/ BTU/sq.ft./inch/hour/degree F. at 75 deg. F. mean temperature. Insulation shall have a factory applied integral vapor barrier jacket. In applying, the vapor barrier jacket flap shall be loosened, then coat the 2-1/2 inch flap of the jacket with vapor barrier adhesive, Rubber Adhesive Corp., Bondmaster YY12F, lap cement, or approved equal. Jacket flap shall be completely coated with adhesive. Open insulation cylinder and carefully fit the insulation to the pipe, so that the end to end and the longitudinal joints are tightly butted together to give tight joints. Secure the jacket flap and smooth out to give a neat and finished appearance. Wrap 4 inch wide bands of vapor barrier jacket material, coated on one side with the above type of adhesive, tightly around each end joint and around the middle of each section of insulation. Stapling will not be permitted. Insulation shall fit tight to pipe. Provide seal-off joints at 45 foot intervals in all continuous runs of pipe which have no side take-offs

(2) All fittings, unions, flanges, and pipe hangers shall be insulated with flexible, glass-fiber, blanket insulation wrapped firmly under compression (minimum 2 to 1) and hold in place with spiral windings of jute twine. Blanket insulation shall then be coated with vapor-barrier mastic, "Sealfas 30-36", Benj-Foster Co., or approved equal, lapped over and on to the adjacent pipe covering jacket to provide a continuous seal. Allow the mastic to set and then cover with 1/4 inch of Eagle-Picher, or approved equal, "One Cote Cement" troweled on. Cover the cement, while still plastic with standard weight canvas or glass fabric. Finish the fitting with a 1/4 inch layer of E-P 99, or approved equal, asbestos finishing cement troweled to a smooth even finish and shaped to give a neat appearance. After the final coat of cement has set, paint with a coat of Sealfas 30-36 to give a finished surface. Insulation shall have the same thermal characteristics as specified above for piping. Hanger rods and turnbuckle adjusters shall not be insulated.

(3) Where these drain lines occur in finished rooms and equipment rooms the Contractor shall apply an additional finish cover of white 6 oz. canvas, securely and neatly pasted on and sized for painting. Finish cover of 6 oz. canvas shall be applied over all such exposed pipe, fittings, flanges, etc.

(4) Painting and sizing shall be as specified under "Painting".

(e) Heat Exchanger Insulation:

(1) The building heat exchanger shall be covered with plastic material containing not less than 85% magnesia applied over a 1-1/2 inch mesh wire netting. The netting shall be held away from the shell by metal spacers fastened to the wire. Covering shall be 1-3/4 inch thickness. The final coat shall be mixed half and half with Portland Cement, troweled smooth and finish with 6 oz canvas pasted on. In lieu of plastic material, 85% magnesia block material, of equivalent thickness as specified above for plastic material, properly wired with brass wire may be used. The block covering shall be finished with a 1/2 inch coat of plastic material mixed half and half with Portland Cement, troweled smooth and finished with 6 oz. canvas jacket pasted on. Insulation shall be neatly beveled off at the edges where openings are required. Painting shall be as specified under "Painting".

(f) Ductwork Insulation:

(1) Furnish and install fiberglass semi-rigid board insulation with vapor barrier on all air conditioning supply duct work and outside air intake duct work.

(2) Return ductwork and exhaust ductwork shall not be insulated, except in equipment rooms. Return and exhaust ductwork in equipment rooms shall be insulated same as air conditioned supply ductwork.

(3) All combination heating and cooling supply ducts shall be insulated with 1 1/2" thick 3# density fiberglass semi-rigid insulation with Sisal Kraft vapor barrier.

(4) All duct work insulation shall be fastened to duct work on top and sides with 4" strips of adhesive at one foot intervals. Adhesive shall be applied on bottom of duct in same manner in addition to stick clips on 12" centers. Vapor seal all joints and clip holes with vapor barrier mastic and tape. Tape and point-up joints and breaks on hot air duct insulation with hydraulic-setting cement and asbestos tape.

(5) Apply 6 oz. canvas covering on all insulated duct work exposed in finished rooms, and in equipment rooms. Sizing canvas with fungicidal agent addative, and painting shall be as specified under "Painting".

60-49. Valve Tags:

(a) All main cut-off and control valves throughout the buildings shall be equipped with brass identification tags securely wired to valves with brass wire rings. Tags shall bear an index number and proper label identifying valve and its use. Four type-written sheets listing each valve and its use shall be furnished to the State and a fifth sheet shall be mounted in a framed glass cover in the Equipment Room.

60-50. Access Doors:

(a) All access doors shown on the Mechanical drawings will be furnished and installed by the General Contractor. Mechanical Contractor shall cooperate with the General Contractor for the proper location of the access doors for the best access to valves, fire dampers, controls, etc. for which the doors are to be installed.

60-51. Guarantee:

(a) When all the apparatus herein specified, shown on drawings, or required for a complete system is furnished and installed, the Contractor shall guarantee the installation to operate properly at all times, and to be free from defects for a period of one year. Such defects shall apply to faulty materials, design, or workmanship. In the event of the development of said defects, the Contractor shall remedy the failure at his own expense within a reasonable time after notice.